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An Extension of Science

SO much has been heard during the last few years of the responsibility of science for some of the chief ills from which humanity suffers to-day that the endeavours made by the president of the British Association and several of the sectional presidents to restore a proper perspective are welcome indeed.

The public has often been told that the scientist (including, for the present purpose, the engineer who applies the results of research) is to be blamed for unemployment, and even for the possibility that civilisation may be destroyed—that civilisation which is so largely the work of the scientist himself.

There is surely justification for Professor W. Cramp's retort that the work of scientists is essentially beneficent and that the fault is not in them if it has been perverted to harmful ends. The real question before the world is, however, as Professor J. C. Philip points out, no longer how its requirements can be met technically, but how they can be used wisely. An impressive warning as to the possible consequences of failure to realise this truth was given by Senator Cordell Hull in his address on Monday to delegates from fifty nations to the World Power Conference.

More than ever before is the need felt for linking up ethical with material progress. To Sir Josiah Stamp (who considers unemployment due to technical innovation to be far less than is commonly supposed) the cure for troubles caused by science is more science, but of a different kind—that involving a real knowledge of man, especially in his corporate relationships, which differ so greatly from those of the individual. His is surely a more inspiring creed than that which can see only a race of beings helpless before the conquest of Nature and turning, like an ungrateful Caliban, to curse its benefactor.

The old view that each generation will live in much the same conditions as the preceding one has lost its validity, he suggests, and major changes are no longer to be regarded as breaks in a normal stability. Unless foresight is shown in devising means by which resistance to inevitable change can be smoothed transition is likely to be painful.

One great obstacle to adaptation Sir Josiah finds in the existence of a waste land between the domains of the scientific worker and of the statesman and administrator. The one is not trained to consider the results to society of his labours, just as the other is not in a position to know what the laboratory will bring forth.

This gap, affecting the nature of the impact upon society of technical innovation, could only partly be bridged by each side extending its sphere. Men trained in a new way are therefore required who would be able not only to make a synthesis of knowledge but also to envisage its tendencies and their ultimate effects.

However good an idea appears to be many years may elapse before it finds general acceptance. What is to be the attitude of the scientist in the meantime? Professor Allan Ferguson's advice to him to study the social implications of his work and to discuss them with those outside is excellent so far as it goes, but is not to be taken as encouraging the scientist to regard his success in the production of potential benefits as any qualification to govern their consumption; he would be as much an amateur in this field as would the politician in the realm of technics.

Most certainly he should not abate his efforts to discover, invent and fashion. Apart from the use of his brains in this specialised way, however, he can, by working to increase the value of his profession to the community, make it a model for the building-up of the new ethics called for by modern collective organisations. This implies the need, emphasised by Professor Cramp, that educational systems should not neglect the ethical nature of the individual, since the placing of integrity before self-interest will always be the basis of healthy corporate relationships.

World Power Conference

THERE is justifiable unanimity among British contributors to the World Power Conference in attributing the tardy early development of electricity supply in this country to the original Act of 1882, which, in the absence of technical prevision, permitted short-sighted political considerations to prevail. It would be a mistake, however, to regard the historical aspects—familiar to our readers—of the papers by Messrs. J. C. Dalton, H. C. Lamb and W. B. Woodhouse merely as authoritative historical records for the bookshelf. A knowledge of history may be used to prevent history repeating itself. From the past, seen through the eyes of men intimately associated with the present and accustomed for practical reasons to envisage the future, many useful deductions may be drawn. In this the proper use of statistics, discussed by Messrs. H. Quigley and A. S. Windett, is essential. The latest development is, of course, the grid (since the McGowan Report was not available when the papers were prepared), the aims and scope of which are concisely stated by Mr. H. Hobson. Two distinctly informative papers in the Distribution Section, those by Messrs. J. R. Beard and S. E. Britton, deal with practice that is widely accepted but not yet universally followed.

Ousting the Horse

THE Minister of Transport recently decided to give notice that certain congested areas in London, notably Old Bond Street, the City of Westminster, High Holborn, parts of Regent Street, New Bond Street and New Oxford Street, might be closed to horse traffic during September. That such slow traffic is a source of danger and financial loss due to delays to other road users no one will deny, but representations to the Ministry for the abandonment of the proposal have been made, mainly on the grounds of the higher cost of the motor vehicle where door-to-door deliveries are involved. It has been said that half a dozen "mechanical horses" will do the work of half a dozen horses at lower cost, but that does not apply where only one horse vehicle is involved. It is here that the Electric Vehicle Committee should step in to make it known that the small electric vehicle, which has proved itself to be ideal for delivery work, will fill the bill with its cleanliness, rapidity, long life and low maintenance cost, enabling a favourable comparison to be made with the horse-drawn vehicle.

Marine Propulsion

A POINT in favour of the electric propulsion of ships that has recently been suggested to us is that the use of an electric motor with a short tail shaft overcomes certain early troubles due to hull movement. After launching the vessel goes into the calm water of the fitting-out dock, where bearings are lined up and everything is made ready for the trials. Until the ship is actually going at full speed the movement of the hull, and consequent movement of the bearings, cannot be known, and a critical speed may be reached at which the bearings become sufficiently out of alignment to heat up suddenly. We are informed that bearing overheating has caused propeller shafts having a diameter of as much as eleven inches and running at 380 r.p.m. to bend.

The Priestman Engine

MR. WILLIAM DENT PRIESTMAN, who died at Hull, on September 7th, at the age of 89 years, has special claim for mention in these pages by reason of the pioneering work performed by him in 1888 and following years in connection with the invention and production of the petroleum engine. Some sixty years ago he founded the business which is now known as Priestman Brothers, Ltd., engineers and dredger-makers, of Hull, and he was undoubtedly a pioneer of the oil-engine industry. Those who are sufficiently interested will find references to his early engines used for running small electric lighting plants in the volumes of the ELECTRICAL REVIEW published at that time. A report by Lord Kelvin (then Sir William Thomson) and others on small engines and tests thereon appeared in the ELECTRICAL REVIEW of May 4th, 1889. Another report in the same issue was concerned with a 6-h.p. engine in the works of the Electrical Power Storage Co. at Millwall. It is signed jointly by Sir Samuel Canning and Messrs. H. Alabaster, Gatehouse & Co., consulting engineers, the then proprietors of the ELECTRICAL REVIEW. These experts foretold for the engine a field of "unlimited" usefulness, especially in inaccessible localities in foreign lands where motive power was difficult to get. This was close upon fifty years ago, and we suppose that to few engineering inventors has it been given to witness such vast achievements following upon their own early work.

A Wise Decision

IN deciding to prohibit the use of mains-operated radio sets on the power circuit the Bridgend U.D.C. stirred up a veritable hornet's nest about its ears. Not only were the local people intensely annoyed, but the decision even had its repercussions in the London Press. The protests have had swift success, for at its last week's meeting the Council rescinded its decision and Bridgend listeners-in can now operate their sets without being threatened by the shadow of a bill estimated by one councillor at between 3s. and 4s. a week. The Bridgend U.D.C. has altered its mind just in time to avoid the notoriety thrust upon the village that voted the earth was flat.

Road Safety

MORE than half of the 37,000 deaths on the United States roads last year occurred at night, the *Electrical World* states. The proportion in congested districts was much higher, but it is significant that the ratio is increasing, day fatalities indicating a downward trend. On roads with modern systems of illumination the number of accidents has been reduced by from 35 to 40 per cent. The conclusion drawn is that, while such expedients as inspecting cars, examining and educating drivers and erecting signs are commendable, it is to adequate lighting that we must look to provide the quickest and surest way of reducing the hazards of road travel. This supports the views expressed by Mr. E. C. Lennox in his presidential address to the A.P.L.E. Probably twice as many lumens as at present are required for safety, but, as he points out, the use of the most suitable equipment is also essential, and only through the appointment of properly qualified public lighting engineers for the larger administrative areas which are considered necessary can adequate results be achieved.

The Chemical Engineer

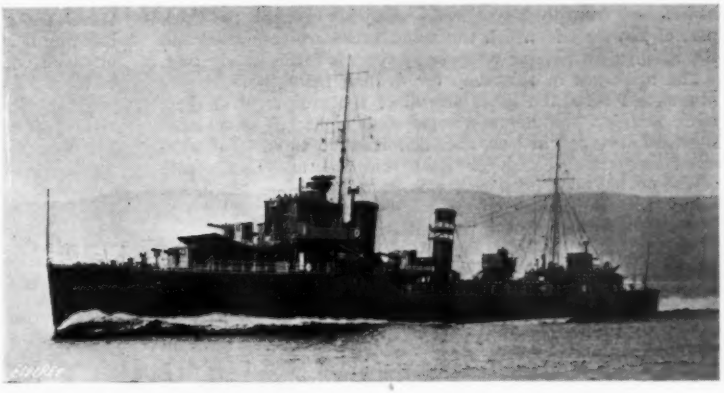
THERE is much in common between electricity and chemistry and an increasing number of products in everyday use are obtained by electrolysis, as the *Daily Telegraph* points out in its "Chemical Industry Supplement." The manufacture of chemicals also entails the consumption of electricity on a large scale at high load factors that alone would justify the exploitation of the nation's water-power resources. If chemical substitutes for food and other essentials of life are to enable people to become independent of geographic conditions in the future, as has been suggested, it will at all events be of some benefit to the electrical industry that the chemical engineer will be called upon to carry out the synthesis.

A Cautionary Tale

A MANCHESTER contemporary reports that an employé of a Lancashire Electricity Department lit his gas cooker one day last week and was immediately blown out of the kitchen by a terrific explosion. We are glad to learn that he did not sustain anything more serious than a severe shock, but we cannot help thinking that there is a moral to be drawn from this incident.

Electricity in Ship-building

Equipment used in a Clydeside shipyard and engineering shops



H.M. Flotilla Leader " Faulknor," recently built in the Yarrow shipyard

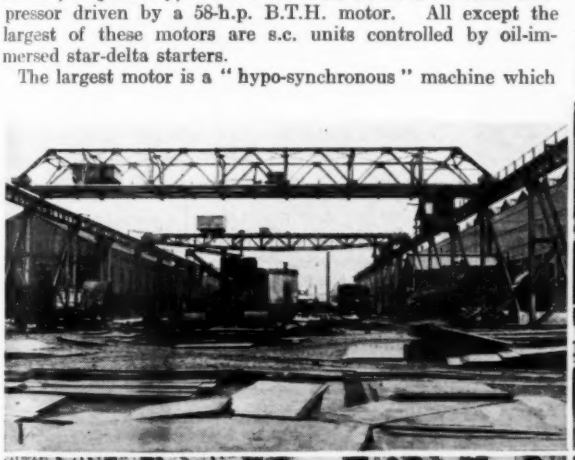
HYDRAULIC, compressed air, welding and direct machine drives are the forms of power used in the shipyard and engineering shops on the Clyde of Messrs. Yarrow & Co., Ltd., but in all cases the initial source of power is electricity from the public supply system of the Clyde Valley Electrical Power Co. Hydraulic power is used mainly for plate bending and particularly for the shells of medium-pressure boilers in the boiler shop. These plates are bent hot and are fed direct from a furnace into a 300-ton press. For the hydraulic service there is a set of pumps driven by a 100-h.p. B.T.H. slip-ring motor controlled by drum-type equipment which is geared to a small hydraulic plunger operated by limiting trips on the accumulator.

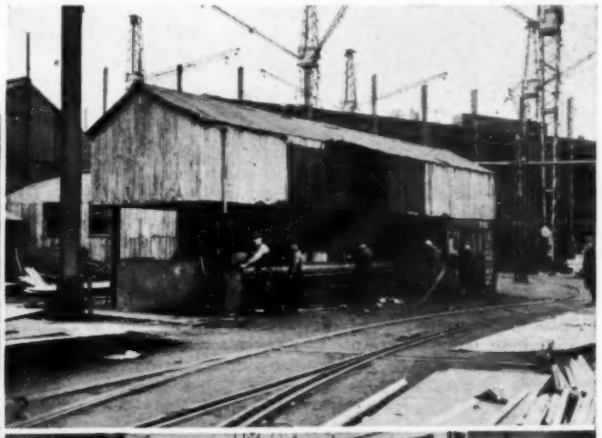
Compressed air is used mainly for drilling holes in the hull plates of ships during erection on the score of economy, and also for riveting, chipping and caulking. A comprehensive range of equipment for the supply of compressed air includes a 1,500 cu. ft. air compressor driven by a 300-h.p. Laurence Scott motor, a 400 cu. ft. machine with an 85-h.p. Greenwood and Batley drive, 250 cu. ft. and 200 cu. ft. Alley and McLellan machines driven by 66 h.p. and 50 h.p. E.C.C. motors, respectively, and a 220 cu. ft. Bellis & Morcom compressor driven by a 58-h.p. B.T.H. motor. All except the largest of these motors are s.c. units controlled by oil-immersed star-delta starters.

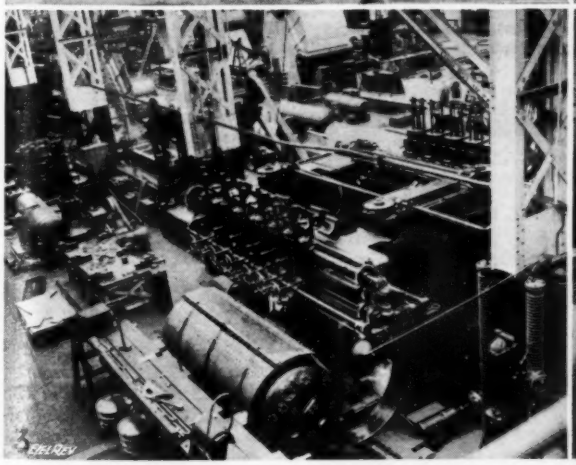
The largest motor is a " hypo-synchronous " machine which is, of course, used for power-factor improvement and was installed when the works supply was changed to 50 cycles recently, advantage being taken of the opportunity to modernise the equipment where advisable. The motor operates with a leading power factor of 0.9 and the rotor volts are 1,090. The exciter, stator and rotor starter currents are 180 A, 380 A and 185 A, respectively.

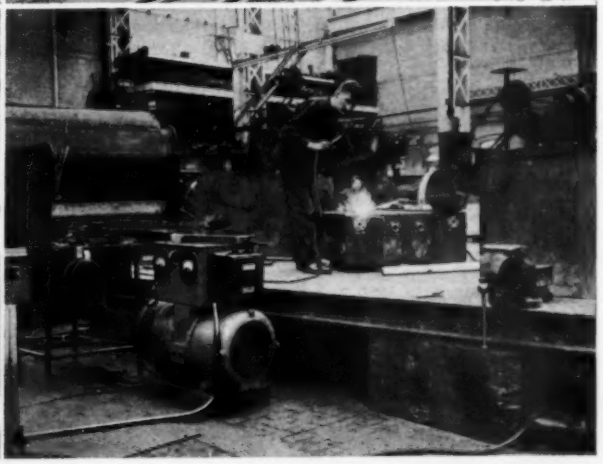
The motor is excited by Heyland equipment separately driven by a 10-h.p. d.c. motor. One of the characteristics of the exciter is that it will automatically maintain the degree of p.f. improvement practically constant irrespective of the variations of load on the motor. The hypo-synchronous motor will continue to run at full load as an ordinary induction motor, if necessary, with the exciter out of circuit. Control for this set includes an oil circuit-breaker and an Allen West liquid starter.

For d.c welding we saw both portable and stationary motor-generator sets at various points, whilst for a.c. welding there are a number of British Electric transformers to give 90 V, single-phase supplies. With these a.c. transformers either Quasi Arc or Murex regulators are used. The Quasi Arc equipment is oil cooled and has twelve regulating steps with operating limits from 25 A to 200 A. The Murex regulator has a range of current from 50 A to 200 A, and is of the sliding-core reactance type of equipment.









1. Seven-ton travelling cranes. 2. Cold-bending plate rolls with individual drive. 3. Multi-spindle tube-hole boiler drilling machine. 4. D.c. welding from motor-generator equipment

Most of the direct drives throughout the works are for more or less standard machine-shop work and equipment adapted to the particular processes required for the Yarrow productions. In the boiler shop, for instance, there is an interesting individual drive for a large planing machine on which the edges on the boiler plates, after being bent, are machined. The thickness of the plate is reduced by machining for a few

inches back from the edges where the joint between the thick part of the shell to which the boiler tubes are connected and the thinner portion (or wrapper section) is made by riveting.

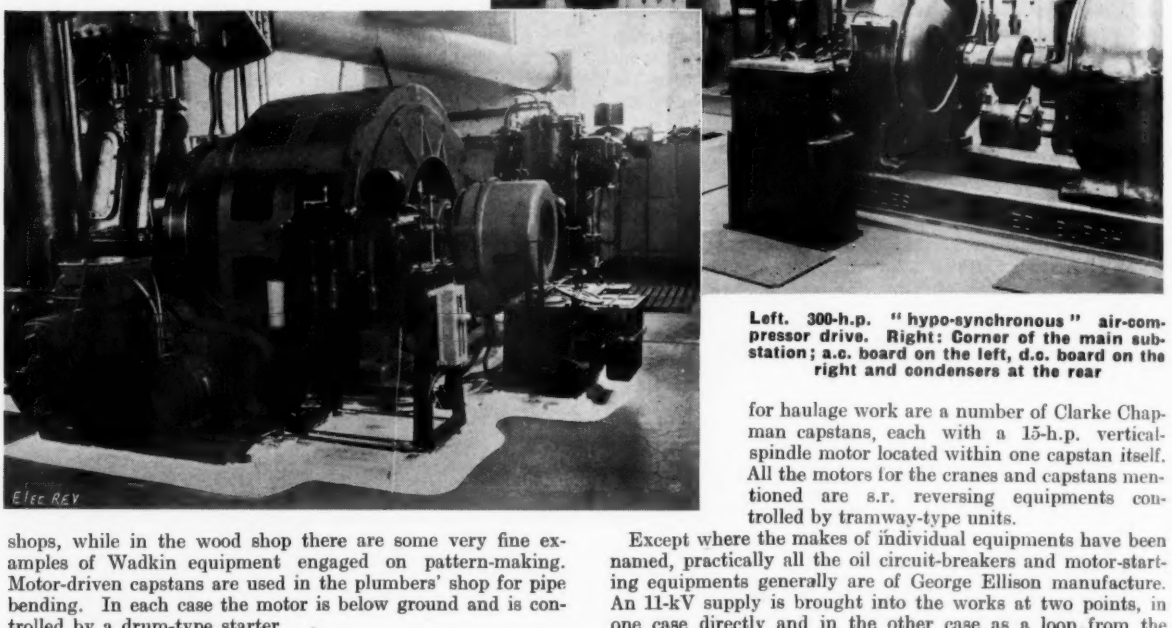
The machines in this shop for drilling holes in the boiler drums to receive the tubes are all of the multiple-drill type, some with six spindles and some with eight; in some cases they are arranged in back-to-back formation to afford double-sided six-spindle machines. Each machine, and in the case of the double-sided ones each side, is driven by a 30-h.p. s.c. motor with star-delta control.

Among the equipment of particular interest in the yard itself is a large plate-bending roll which takes 25-ft. wide plates and is driven by a 45-h.p. s.r. reversing motor housed below ground with its reducing gear. The machine is equipped with a solenoid brake, and the motor is governed by a tramway-type controller.

Many excellent examples of individual drives are to be seen in the fitting machine, fan and plating shops, while in the wood shop there are some very fine examples of Wadkin equipment engaged on pattern-making. Motor-driven capstans are used in the plumbers' shop for pipe bending. In each case the motor is below ground and is controlled by a drum-type starter.

Of considerable importance as a power user is the very extensive lifting equipment throughout the works. Over the main yard on an 85-ft. span run two seven-ton travelling cranes each equipped with a 20-h.p. motor for hoisting, a 20-h.p. motor for longitudinal travelling and a 10-h.p. motor for cross travelling. An important part of the works layout is a fitting-out basin, and over this is a 50-ton travelling crane with a 93-ft. span. This has a 50-h.p. motor for hoisting, a 20-h.p. motor for auxiliary hoisting, a 50-h.p. motor for longitudinal travel and a 20-h.p. motor for cross travel. Over one of the building berths we saw similar equipment but of 10 tons capacity and with an 85-ft. span. Its three motors are: hoisting 30 h.p., longitudinal travel 20 h.p. and cross travel 10 h.p.

Alongside the building berths are three-ton double-jib derrick cranes, each equipped with a single 10-h.p. motor. This is situated on a base platform and operates the jibs *via* ropes, while a double-pulley arrangement provides the necessary means for changing over the jibs. At the heads of the berth for haulage work are a number of Clarke Chapman capstans, each with a 15-h.p. vertical-spindle motor located within one capstan itself. All the motors for the cranes and capstans mentioned are s.r. reversing equipments controlled by tramway-type units.

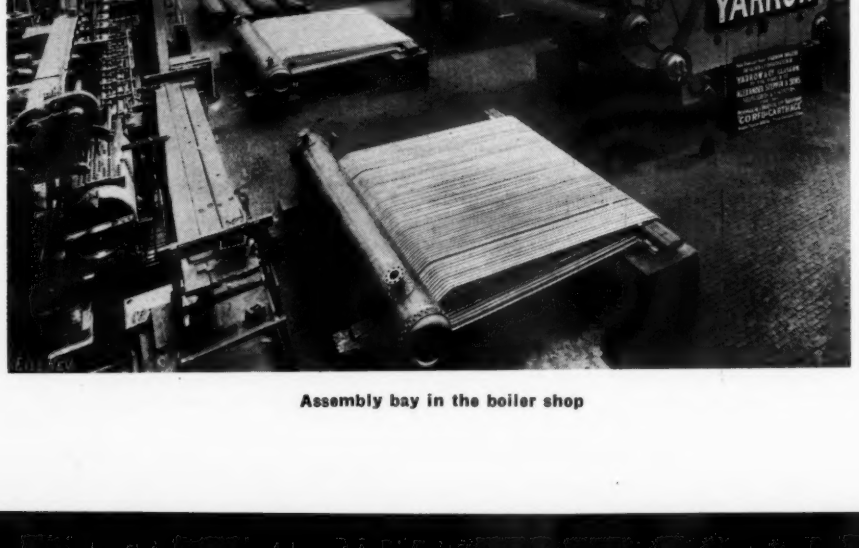


Left. 300-h.p. "hypo-synchronous" air-compressor drive. Right: Corner of the main sub-station; a.c. board on the left, d.c. board on the right and condensers at the rear

Except where the makes of individual equipments have been named, practically all the oil circuit-breakers and motor-starting equipments generally are of George Ellison manufacture. An 11-kV supply is brought into the works at two points, in one case directly and in the other case as a loop from the other sub-station, but supply is actually taken by the shipyard at 440 V (250 V s.p. lighting) at which pressure it is utilised either directly after distribution from an open-type Ferranti switchboard with oil circuit-breakers in the main sub-station or as 210 V d.c. after conversion by motor-generator sets in the same "sub" and distribution from a similar switchboard equipped with air circuit-breakers.

Most of the distribution for both a.c. and d.c. is by the Callender solid underground cable system utilising unarmoured bitumen cables laid in earthenware troughs filled with bitumen, but to the dock side and to buildings convenient for tee-offs overhead conductors are arranged on lattice steel masts and bracket uprights on the buildings.

The shipyard has direct communication with two railways, and presents a frontage of 872 ft. to the Clyde where that river is about 500 ft. wide at high water and 25 ft. deep at low water. It is near the Admiralty deep-water measured miles at Skelmorlie and Arran, and adjacent to the S.W. Scotland iron and coal-fields. In addition to the shops for boiler making, galvanising, pattern making, joinery, plumbing work and smithing, there is an experimental shop in which equipment for testing boilers and turbines includes a high-pressure Yarrow water-tube boiler suitable for 1,200 lb. per sq. in. working pressure and fired with pulverised fuel, a dynamic balancing machine, a complete condensing plant, and suitable weighing apparatus.

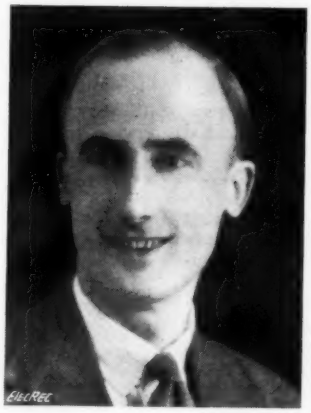


Assembly bay in the boiler shop

Electricity Regulations. By G. V. Harrap

A BETTER appreciation of the implications of the Electricity Supply Regulations, 1934, and the I.E.E. Wiring Regulations can be obtained from a realisation of the conditions pertaining elsewhere. For example, in the United States regulations are enacted by each of the forty-eight States (since the Federal Legislature can only deal with inter-State services), but the requirements of the N.Y. State Public Service Commission, the main features of which are discussed below, are typical of the best practice there. The numbers given refer to comparable paragraphs in the British Regulations, El. C. or I.E.E.

No undertaking is permitted to install on a consumer's premises any appliance, switch or fitting the type of which has not been approved by the Commission, which issues regulations covering the conditions of approval, the shipment of samples, approval limits, modifications and destruction of samples. In Great Britain a certain amount of apparatus is covered by B.S. Specifications, but general provisions only are made in the Electricity Supply Regulations.



Mr. G. V. Harrap. A personal note appears on page 357

Services

For circuits up to 600 V conductors from the point where they enter the building to the service point must be installed in metal conduits or other approved ducts, or supported in an approved manner (El. C. 25).

Service-wire and cable joints are to be soldered, unless made with some form of approved splicing device, and then covered with insulation equal to that on the conductor (I.E.E. 312-3).

Metal conduits containing service wires must be insulated from all conduit, metal work and cable systems in the building, and must be permanently earthed. The earth wire must be independent of, and in addition to, any other earth wire in the building (El. C. 14).

Service wires must be of at least No. 10 B. & S. gauge and where extended to the exterior walls of buildings, they must be run in conduit or supported on petticoat insulators placed not more than 15 ft. apart. Wires and cables entering buildings are required to have drip-loops outside. Entrance holes must be bushed with non-combustible, non-absorptive insulating tubes inclined upwards towards the inside. Service wires may, however, be brought into a building through a single iron conduit equipped with a service head, the inner end being extended as far as the service cut-out or switchboard.

Where a row of separate buildings is to be supplied from an overhead service, one service cable may be run from the main and a sub-service cable extended in conduit along the outside of the buildings. One main service cable may not have more than five installations connected to it without special approval. Wires must be at least 8 ft. above the highest point of roofs over which they pass or to which they are attached. Roof lines are permitted only under special authorisation. Reference should here be made to paragraph 368 of the report of the McGowan Committee on Electricity Distribution relating to wiring under roof eaves and to the provisions of our Overhead Lines Regulations.

Protection from mechanical injury and moisture is demanded where a service cable is brought into an installation (I.E.E. 401). Service tubes must have the ends so closed as to prevent the entrance of gases into the building (El. C. 22).

Where a row of separate buildings is supplied from an underground main, one service cable may be run from a main into a building and from the point of entry a sub-service main may be extended underground, or in an exposed iron pipe outside the building, or under, along or within the wall, providing that at all times the cable is protected with two inches of brick.

Service switches are to be arranged so that the fuses and the opening of the switch will protect all the wires except those permanently earthed (El. C. 13).

An automatic overload circuit-breaker controlling a two- or three-phase three-wire circuit or a two-phase four-wire circuit is required to have a trip coil in each phase. One pole must not be capable of being opened manually without disconnecting all the phases, except the earth wire.

Switches, cut-outs and circuit-breakers, where they are exposed to mechanical injury or where there is fire risk, must be mounted in specially approved and tested cabinets, except for circuit-breakers with special castings.

American and British practice compared

Automatic cut-outs must be placed on all service wires (except earth wires) whether overhead or underground, in the nearest accessible place within the walls to the point of entry to the building. They must be arranged to cut off the entire supply of current from the building (El. C. 24). Special provisions apply to the supply to fire alarms, fire pumps and exit lights which are connected ahead of service switches.

Switches must indicate whether they are open or closed, and single-pole switches must never be used as service switches (I.E.E. 207). Single-throw switches must be so placed that gravity will not tend to close them. Double-pole switches may be mounted so that the throw is either vertical or horizontal, but if the throw is vertical a locking-open device is called for.

Transformers must not be attached to any building where the potential exceeds 600 V. Those containing oil must not be placed inside a building unless situated in a special vault. Transformers permitted inside a building have to be installed as near to the primary wires as possible. The vaults have to be constructed of fireproof material, and there must be no opening to the installation except through a tight-fitting fire door. It must be ventilated in an approved manner and used only to contain transformers and other service equipment. Oil drains and guard sills are specified, and only responsible persons are allowed to enter the building. (El. C. 9b, 9c, 10a and 19. See also references in the 1899 Act.)

Earthing

Earthing of low-voltage circuits is only allowed when normally there would be no appreciable passage of current to earth. On underground systems the neutral wires must be earthed at each distribution box, either through the box or to a system earth wire connected to the earthing conductors of many secondary mains or on the individual service.

Transformer secondaries of distributing systems must be earthed if the maximum voltage difference between the earth point and any other point in the circuit does not exceed 150 V. The earth is made at the neutral point or wire whenever such is available; otherwise one side of the secondary circuit is earthed. The earth must be at the transformer or on the individual service and may be connected to a system earth-wire in contact with three or more other secondary mains. When one or more transformers feed a system having a neutral, earthing is required at the transformer and also at every 500 ft. or less.

Earth wires must be of copper of not less than No. 6 B & S gauge, and must have an insulating covering. On three-phase systems the capacity of the earth wire is stipulated to be equal to any one of the three mains. The cases or frames of transformers used exclusively to supply current to meters shall be earthed unless they are installed and guarded in all respects, as the associated higher-voltage circuits are required to be.

Earth connections to metallic piping systems should be made on the street side of the water meters, but connections may be made immediately inside building walls to secure accessibility for inspection and testing. When water meters are situated outside buildings or in concrete pits within buildings where piping connections are embedded in concrete flooring, earth connections may be made on the building side of the meters, if they are suitably shunted (I.E.E. 1006A).

Meters should be installed in clean, dry places, not subject to vibration or great variations in temperature, and easily accessible for reading, testing and repairs. Where the points of installation are exposed to the weather, meters must be protected by boxes or cabinets.

Requirements comparable to some extent with Nos. 27, 28, 29 and 30 of the Electricity Supply Regulations are also contained in the Regulations of the Public Service Commission. If the Commission considers any apparatus or circuit to be dangerous to persons or property, it may, after reasonable notice to the undertaking, require the installation to be disconnected until the defect has been removed.

The Regulations of the N.Y. Public Service Commission are far less detailed than either the I.E.E. Wiring Regulations or the Electricity Supply Regulations, but their general trend is similar, though they resemble more closely the Regulations issued by the Home Office.

Power for Railway Signalling.

By H. C. Towers, A.M.I.E.E.*

A.c., d.c., primary battery or secondary battery?

RAILWAY electrical signalling installations can usually be divided into (*a*) Track-circuiting of a station yard with electrical detection of points, &c.; (*b*) the same with power operation of points and signals; (*c*) electrical interlocking of several interlockings, inter-connected by stretches of line operated by automatic signals and continuous track circuits; and (*d*) electrical adjuncts to existing mechanical schemes and remote control of outlying points.

If a station yard within classification (*a*) and on an electric line is being resignalled it will probably be feasible to use the traction supply, but on a mixed traffic railway an alternative source is necessary lest failure of the traction supply should cause additional confusion. In any case, the alternative supply must be the same as the main supply, which would not be the case in a number of instances where d.c. traction is in use, as most lighting systems are now a.c. Where d.c. is used it is reduced to the required voltage by a series of shunts.

In the case of an all-electric scheme, where signals and points are worked by power, it may be advisable to operate the point machines, point detection and other apparatus connected with these functions from secondary batteries "floating" on the supply main. Thus, in the event of a power supply failure the points can still be operated to move trains and engines about the yard. If an alternative a.c. supply is available, it is usual to treat this as the main supply and the railway d.c. supply as the alternative.

Advantages of A.c.

The use of a.c. for railway signalling purposes is preferable because of the ease and efficiency in transforming voltages. In addition, it permits the use of an a.c. track circuit. This is more suitable because it is not necessary to maintain such a high standard of insulation for the actual track circuit as is required for a d.c. track operated by batteries. Further, the relay is immune from the effects of extraneous currents and is not liable to residual magnetism. If alternating extraneous currents are anticipated their effects can be avoided by the selection of a suitable frequency for the signalling main.

The actual supply of power is also much more economical, being made through track transformers situated at signal positions, while maintenance is very much lower. A standard voltage for the signal main is adopted and the various sub-circuits are fed through step-down transformers. This voltage is usually 110, to which standard most signalling manufacturers design and manufacture their apparatus.

In the signal cabin two single-phase transformers are connected to a double-pole change-over switch on the primary side. The secondary side is provided with taps, adjustments being effected between 110 and 120 V by means of links, to compensate for any variation on the supply main. One transformer is essentially a spare and can be brought into use in an emergency. A voltmeter and ammeters are provided on the switchboard to indicate the signal-main voltage and total load. The cabin transformers also feed the yard ring main that is looped in to every signal location where the 110 V supply is required, and is stepped down by means of local transformers to suitable voltages for feeding signals, track circuits, &c.

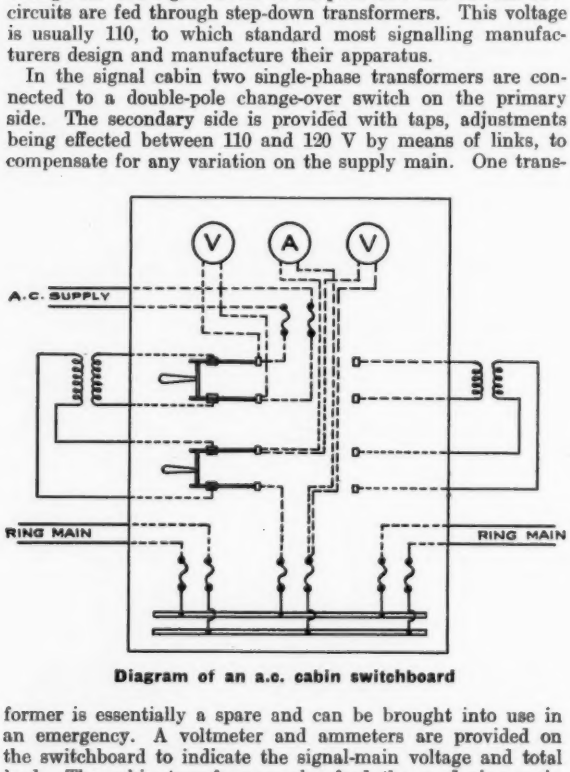
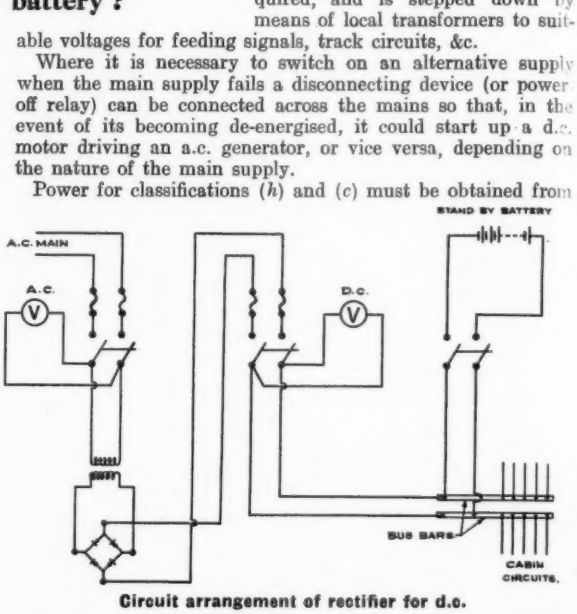


Diagram of an a.c. cabin switchboard

Where it is necessary to switch on an alternative supply when the main supply fails a disconnecting device (or power off relay) can be connected across the mains so that, in the event of its becoming de-energised, it could start up a d.c. motor driving an a.c. generator, or vice versa, depending on the nature of the main supply.

Power for classifications (*b*) and (*c*) must be obtained from a signal main running alongside the railway. This is essential because in an automatic signal territory signals are usually placed at every 1,000 to 2,000 ft. and a feed for local circuits is required at these points. The signalling main must, therefore be supplied by means of transformers at suitable points, generally in signal cabins or in adjacent cubicles.



Circuit arrangement of rectifier for d.c.

Battery Operation

If an outside or railway supply is not available, primary or secondary batteries are employed in case (*a*). Classifications (*b*), (*c*) or (*d*) require very careful consideration. As explained earlier, in automatic signal territory signals and locations need to be placed every 1,000 to 2,000 ft., which means that batteries also would have to be situated at these places to supply signals and track circuits. If secondary batteries are used, suitable charging points have to be arranged, and there is also the question of transporting batteries to individual positions.

Primary batteries are to be preferred, the air depolariser variety now available being particularly well suited for circuits taking low continuous "drains." The voltage of signal circuits for electro-mechanical or electro-pneumatic interlockings, operated by primary batteries, is usually between 10 and 15 V, with the exception of track circuits. The batteries are arranged in series-parallel to provide an adequate voltage and capacity, so that each sub-section delivers the same power.

The sub-sections are interconnected by a suitable terminal and linking arrangement, finally feeding to a common bus-bar. If this method is used a whole section of cells can be disconnected at the same time for the purpose of cleaning and installing new elements. Most of the circuits are intermittent, so that the total load on the battery is usually less than 1 A.

Where an a.c. source is available the copper oxide rectifier enables great economies to be effected so far as battery operation is concerned. The type that operates at a low voltage and has a full load capacity of one ampere is quite sufficient for an essentially intermittent load, such as single stroke bells, lever locks and d.c. signalling relays, which operate on a few milliamperes.

A step-down transformer is employed to feed the a.c. side of the rectifier, the d.c. side being connected to the cabin bus-bars. A standby battery of primary cells, of the air depolariser type, is also connected to the bus-bars and (owing to the rectifier only passing current one way) they can be connected so as not to feed out to the mains as well as the load when the main supply is shut down. A secondary battery can be used in place of the primary type and placed on trickle charge. In my own experience the introduction of this system has effected an annual saving of over £300 per annum in battery maintenance, and it is hoped to be able to effect further economies in this direction in the near future.

The possibility of transmitting energy at 110 V to wayside stations, where no ordinary supply mains are available, has developed a new system in electrical signalling. A much smaller amperage is required to operate point and signal

(*Concluded at foot of next page*)

* Divisional signal engineer, Bombay, Baroda and Central India Railway.

Better Light—Better Sight. By W. J. Jones*

The E.D.A.-E.L.M.A. national lighting campaign

ASK your salesmen and showroom assistants to talk "Better Light—Better Sight" on every possible occasion. Anyone can dispose of a lighting fitting to a customer, but the "Better Light—Better Sight" movement goes much further.

Are you giving your eyes a chance? Have you enough light? Is your lighting conducive to eyesight preservation? These are questions which will interest everyone. It is a fundamental fact that the average person given free choice would choose from five to ten times more light than he has in use at the present time.

The whole direction of the campaign is towards making the public "eyesight conscious." The national advertising, financed jointly by E.D.A. and E.L.M.A. emphasises care of eyesight especially for the young and aged, and shows that increased light for eyesight preservation costs so little.

Appeal to Sixteen Million Readers

E.D.A., representing the supply undertaking propaganda organisation, is behind the campaign on one hand, while those electric lamp manufacturers associated with the E.L.M.A. Lighting Service Bureau represent the other main sponsors. They are jointly financially responsible for the national advertising to commence in October, and will make an appeal to no fewer than 16 million readers, the bulk of whom are already electricity consumers. As associated with the sole supporters of the E.L.M.A. Lighting Service Bureau, the brands of "Osram," "Mazda," "Ediswan," "Siemens," "Cosmos," and "Cryselco" lamps are featured in these advertisements. This is as things should be, since the E.L.M.A., through its Bureau, is doing valuable propaganda and development work year in and year out and co-operates to the full with all electrical propaganda which is likely to assist in the development of the lighting business. This is only one of the many reasons why the electrical industry should give especial support to these manufacturers.

One light in a room inevitably leads to eyestrain. How much better to have light just where it is wanted as demonstrated in this episode from the E.L.M.A. film, "The Science of Seeing"

Co-operation with Opticians

The "Better Light—Better Sight" movement is gaining favour in all parts of the world, and so far as this country is concerned has resulted in the closest possible co-operation with opticians. The British Optical Association and the Joint Council of Qualified Opticians have recognised that lighting plays a dominant part in seeing. An optician can assist eyesight by providing lenses to correct optical defects, but he recognises that a first-rate standard of lighting is a primary necessity.

This co-operation can be of the greatest possible mutual value to the optician, to the electrical industry, and not least, to the public at large. Did you know that opticians prescribe no fewer than a million pairs of glasses per annum under the National Health Insurance scheme? Without any exaggeration the opticians must be in touch with at least two million people every year. *The opticians will ask their clients when making the prescription for glasses whether the artificial lighting conditions for reading and sewing are satisfactory,* and commend them to one or other of the electrical people in the neighbourhood. Supply undertakings and contractors would, therefore, be wise to link up with the opticians in their area and endeavour to make arrangements for full co-operation this winter. The electrical industry can assist opticians by giving them advice on the lighting of their consulting rooms and windows.

Thousands of Light-Sight Windows

The electrical industry and opticians are being asked to make a mass appeal to the public by installing "light-sight" features in their windows this autumn, but especially during the week commencing October 5th. This is the first week

* Manager, E.L.M.A. Lighting Service Bureau.

Power for Railway Signalling (*Continued from previous page*)

machines at 110 V than is possible with low-voltage apparatus working from primary batteries. It is, therefore, possible to transmit the power direct (without the necessity of bringing into operation a local source of supply) by means of relays.

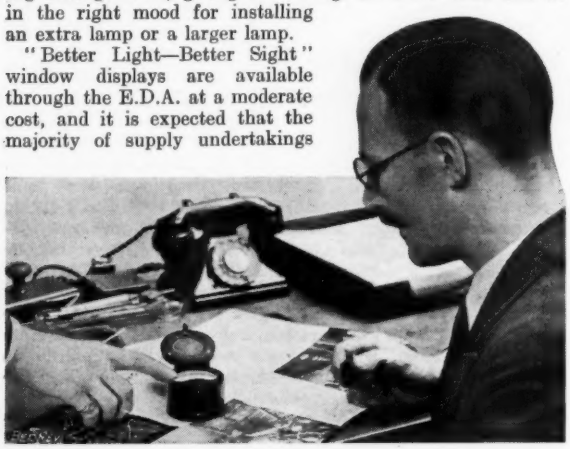
Power in this case is supplied from the signal cabin by means of a hand generator. This machine is driven through gearing by a winding handle and is usually fixed adjacent to the lever frame. The various circuits which require to be operated are selected by circuit controllers fixed to the levers. For example, if it is required to reverse a cross-over road, the lever or slide controlling it is pulled to the midway position and the handle of the generator rotated. The normal time for operation is about eight seconds and, apart from the indication devices attached to the levers, the operator becomes aware when the points have "thrown" due to the diminution of the load on the machine. This system is now in use in many parts of the world, operating outlying points and junctions at distances of over two miles from the signal cabin.

The main disadvantages of the use of secondary batteries are the necessity of charging points and of transport to outlying locations, with the attendant risk of damage. Where several large signal cabins are close together secondary cells can be employed in conjunction with a petrol-electric charging set, but this requires careful comparison with primary cell cost.

Methods of supplying power for railway signalling purposes, with reference to both maintenance costs and efficiency, may therefore be classified in the following order of merit: (*a*) a.c., (*b*) d.c., (*c*) hand generator systems with primary batteries, or primary batteries only; and (*d*) secondary batteries.

after the change-over from summer to winter time and is therefore most opportune for making a concerted appeal on lighting matters. At once everyone will be thinking of lighting arrangements, giving the fittings an extra clean and be in the right mood for installing an extra lamp or a larger lamp.

"Better Light—Better Sight" window displays are available through the E.D.A. at a moderate cost, and it is expected that the majority of supply undertakings will not hesitate to install the E.D.A. display just as it is. It associates lighting with eyesight and provides a friendly gesture to opticians by including the following message: "Consult an optician at the first sign of eye trouble," and then proceeds to the electrical message "But remember that glasses are no use in the dark—use not less than 100 watts in a reading lamp."



Demonstrate to your clients with light meters

Electrical contractors and retailers may have greater difficulty in including the E.D.A. window display as a whole. It is, therefore, suggested that at least they make an endeavour to include in their windows one of the posters "Have Better Light for your Eyes' Sake—Electric Light is Cheap" or "Electric Light for Better Sight" or one of the educational charts. The latter cost only 3s. 6d. each. In some instances it should be possible to borrow a few spectacles or lenses from a friendly optician, and these, with a few lamps, should make an interesting display of the kind illustrated. Make full use of the slogan "Better Light—Better Sight."

While the electrical industry is being asked to make such window displays, the Registrar of the Joint Council of Qualified Opticians has included in the opticians' "Better Light—Better Sight" programme a special feature of the light-sight window displays and is providing opticians with suitable posters and cards which can be installed readily in every optician's window. The illustration on page 350 shows the kind of cards opticians will be using. The least the electrical industry can do is to paste up reprints of the national Press advertisements in their windows or interiors of their premises.

Hitherto we have been content to provide just enough light by which to see; eyes have been handicapped by the strain of seeing under difficulties. The new "science of seeing" aims at providing adequate illumination under which seeing can occur without strain on the eyes or on the individual. It is apparent that what we have been in the habit of calling good lighting—10 or 15-ft.-candles—is but a mere fraction of what the eye requires in order to function satisfactorily, and from this point of view it is evident that the lighting market is exceptional in being almost without a saturation point.

The appeal is in both directions. In some instances larger lamps will give the extra light that is required, but in most instances the best seeing conditions can only result from the use of additional lighting points in the room. This last may prove more difficult to achieve, but the endeavour should be made, since one of the greatest handicaps to electric lighting development in this country is the dearth of plug points in every room in the house.

Posters and Leaflets

The posters available from E.D.A., while useful for window displays, &c., have been mainly designed to provide outdoor publicity. Many of the poster sites in the country should be filled with "Better Light—Better Sight" posters. Here, again, opticians are not behindhand, since they are contemplating the issue of sixteen-sheet posters of their own.

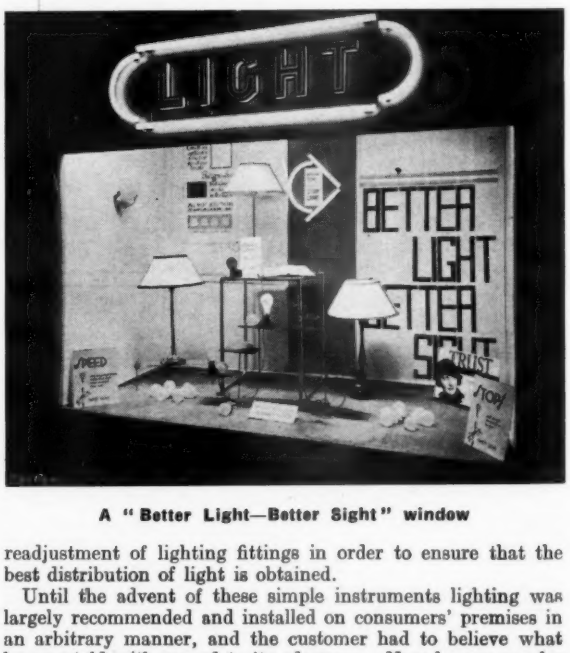
E.D.A. and E.L.M.A. have produced attractive leaflets printed in three colours dealing with "Seeing as a Partnership of Light and Vision" which may be folded and sent to your customers with monthly or quarterly bills. If everyone in the electrical industry will use these leaflets "Better Light—Better Sight" facts will be placed before six million consumers. Copies of these leaflets are available from E.D.A.

National advertising, posters, window displays, are the externals and preliminaries in successful business development. Ultimate business is the result of personal interviews and demonstrations. "Seeing is believing" is still the basis of successful lighting development. The average consumer is not aware that seeing can be improved until an active lighting salesman shows him a good lighting installation. He is prepared to carry on with but 25 per cent. of his lighting requirements, and his eyes, temper and health suffer, while the electrical industry suffers loss of business. Here are some suggestions for selling light on this basis:—

1. Ask all your staff to read the E.L.M.A. handbook "The Science of Seeing." This gives a solid background to the campaign as a whole.
2. Provide lighting demonstrations in your showrooms and if possible install some of the E.L.M.A. science of seeing demonstrations. They enable the consumer to choose for himself how much light he would like to have for comfortable seeing.
3. Ask permission to measure the illumination in your client's home. By this means you will have made a useful contact, and be able to suggest directions in which larger lamps, more points and better fittings could be employed.
4. When visiting your customer have a few lamps available to make a demonstration of improved lighting on the spot.

Need for More Light Meters

Every electricity supply undertaking and electrical contracting firm should possess light meters if they are to be in a position to deal with the lighting problems of customers in an intelligent and up-to-date manner. The fact that the customer can verify the readings taken by the electrical man in his premises gives a great confidence in the recommendations. Light meters are particularly effective in illustrating inequalities of illumination, and in the shop, office and home can be used by the trade to demonstrate the need for readjustment of lighting fittings in order to ensure that the best distribution of light is obtained.



A "Better Light—Better Sight" window

Until the advent of these simple instruments lighting was largely recommended and installed on consumers' premises in an arbitrary manner, and the customer had to believe what he was told with regard to its adequacy. Now he can see for himself.

Opportunities

Meeting the desire of the public for better light will have the inevitable effect of bringing more business to all sections of the electrical industry. Millions of domestic consumers will be encouraged to use more and larger lamps, and this will mean increased electricity consumption, turning many small unprofitable lighting consumers into lighting consumers who pay their way completely. Increased domestic lighting consumption will assist in the adoption of the two-part tariff. Increased consumption makes it more economic for small consumers to abandon the flat rate in favour of the domestic two-part tariff.

The "Better Light—Better Sight" campaign will benefit contractors on account of the great importance attached to extra points in the house. Retailers and lamp makers will gain on account of the more numerous and larger lamps employed. To use the words of a politician of a bygone age: "*ex luce lucellum.*"

The World Power Conference

The third World Power Conference opened in Washington on Monday last when about three thousand delegates representing fifty nations gathered to hear an opening address by Mr. Cordell Hull, the American Secretary of State. Concurrently with the Conference the second Congress on Large Dams is being held. To-day (Friday) the President of the United States is to address the delegates and the concluding session will be held to-morrow. As we have reported, over 200 papers have been presented to the Conference, and a fair proportion of these are by British authors. Some of these papers are dealt with in brief form below.

Rural Electrification in Great Britain

THE achievement of a state of affairs in which the inhabitants of rural areas can get a supply of electricity at economic rates and use it for the same purposes as those residing in the most efficiently served urban areas is the definition given to rural electrification by Mr. S. E. Britton in his paper on "Rural Electrification in Great Britain."

The author holds that such facilities are generally practicable when the gross revenue is 20 per cent. on the capital outlay in providing the supply.

The average population density in Great Britain is 508 per sq. mile, but almost 60 per cent. of the inhabitants live in urban districts (which cover 7,358 of the total of 88,138 sq. miles) where the density is 4,800 and so the average density for the remaining 40 per cent. is about 117 persons per sq. mile. For the country as a whole there are 4.3 persons per occupied dwelling.

Mr. S. E. Britton is city electrical engineer of Chester

Undertakings having rural areas of supply (in almost all cases as adjuncts to urban areas) numbered 315 in 1934-35, covering 69,700 sq. miles. Fifty of these served more than 250 sq. miles each. Premises connected in 291 of such areas for which subdivided returns were made, included approximately 465,000 domestic premises (excluding farms), 11,000 farms and horticultural premises, 62,000 shops and commercial premises, and 5,000 factories and works. In addition, 3,000 farms were served in the "urban" parts of these areas, making, with those connected in other undertakings, a total of 20,000 farms.

A large proportion of the rural population resides near half of the rural roads, and there are electric lines near one-fifth of these roads. There were last year 11,590 miles of high-voltage lines and 14,430 miles of low-voltage lines in rural supply areas. The electrical service is in general for meeting the same kind of domestic and industrial requirements as in towns. It is fundamental that a high proportion of the potential consumers, compared with urban conditions, should be connected, and the demand must be built up more quickly than seems possible by the methods of advertising, circularising, canvassing and showrooms applied to urban conditions.

The organisation must be no less competent than that required in a fully developed urban area, and the staff needs to be even more versatile. The undertaking should be prepared to give free advice and finance the supply of wiring systems and apparatus on hire and easy-payment terms. In many districts electricity is economical when the guarantee required of the consumer does not exceed 12s. per £1 of the net annual value of the consumer's premises.

A higher charge will be regarded as the value of convenience, and one of the first investigations made should be into the amount of money various classes of consumers are accustomed to pay and the standard of service employed for lighting, heat and power services previously. An inquiry among farm employés in Cheshire, living in four-, five-, and six-roomed cottages, showed that the sums spent annually on coal, oil and candles ranged from about £10 to £22. As a general statement the total is equivalent to at least 50 per cent. of the net annual rateable value. The general economic and social status of the rural population is now equal to that of the general body of urban population.

The most widely adopted basis for apparatus on hire is 10 per cent. of the list price and labour cost, and for hire-purchase the list price and labour cost plus 5 per cent. per annum on outstanding instalments.

The charging of higher rates in the early days of supply in order to meet development charges tends to restrict progress. This can be obviated by offering a low rate with an obligation upon the consumer to make a minimum demand each year to include a definite quantity of electricity.

Chester City Council was one of the first undertakings to attempt the complete electrification of a rural area (in which there are about sixty-five dwellings to the square mile), and particulars relating to twelve years' working are given in appendices to the paper. This district occupies 130 of the 144 sq. miles served by the Council, includes 28,000 of the population of 78,000 and nearly 1,600 holdings, two-thirds of which are less than fifty acres each. From the inception a two-part tariff has been available and is now 15 per cent. or 17½ per cent. of the net rateable value (depending upon the distance from the city boundaries), plus 0.6d. per kWh. Consumers have always been able to hire cookers, fires, wash-boilers, and water-heaters.

At the end of March more than 68 per cent. of the possible number of consumers were connected, and these took 6,800,000 kWh during the previous twelve months at a load factor of 38 per cent. Capital expenditure on the scheme was about £212,000, and the income £40,000, which yielded a surplus of £1,000 after meeting interest and sinking fund charges. The confidence of the consumers was obtained by offering to install apparatus to fulfil definite functions for a test period of six months without payment, on the understanding that afterwards, if satisfactory, it would be purchased by the consumer.

An aerial view of Washington, D.C., where the third World Power Conference is taking place

There are 335 miles of road in the area, 104 sub-stations, 97 miles of high-voltage and 150 miles of low-voltage lines. The average number of consumers per mile of road is 20.44 and per mile of l.v. line 45.68. Capital cost per mile of road is £632, and per consumer £30.89. Revenue at 20 per cent. of the outlay would be £6.198; actually the income from two-thirds of the premises averaged 19 per cent. per consumer.

High-voltage lines cost £495 per mile, low-voltage lines £612, and transformers £2.98 per kVA. To-day the expenditure on similar lines would be 30 and 25 per cent. less, and on sub-stations 21 per cent. less. A high-voltage spur line (0.5 sq. in.), with a 10-kVA transformer can be economically installed to supply isolated farms and residences for a guaranteed revenue of £38 per annum.

The Chester rural electrification scheme has demonstrably improved the social conditions of those it serves and has added to their prosperity.

The Organisation and Financing of Municipal Systems

THREE of the British papers presented before the Conference related to the organisation and regulation of electricity supply undertakings in Great Britain. In each an extended reference is made to the retarding effect on development of early national policy as expressed in the 1882 Act, and the modifications introduced in subsequent legislation.

The position of municipally-owned undertakings was Mr. H. C. Lamb's subject. He shows that before the end of the nineteenth century all large towns were supplied with electricity, and that to-day, apart from London, only Newcastle-on-Tyne, Bournemouth and Poole, and Northampton of towns with populations exceeding 60,000 are served by companies. Two-thirds of the population (44¾ millions) is supplied with electricity by publicly owned concerns.

Power stations now in operation number 439, of which 132 (88 publicly owned and 44 company owned) have been selected for operation by the Central Electricity Board. While the owners of the best selected stations are not likely for a time to benefit from the grid, many of the less efficient and smaller undertakings are already securing advantages.

British practice relating to committee control, raising of capital and redemption periods is described, and various statistics are given in appendices. It is stated that at March, 1934, revenue used by municipalities for the purchase of short-lived capital assets amounted to £20.75 million compared with a capital expenditure of £256.5 million, and that rates and taxes paid were 15 per cent. of the total working expenses, excluding interest and redemption. Of the capital outlays 51 per cent. had been redeemed by 1933-34.

The pros and cons of municipal and company operation are set out and the conclusion is reached that, broadly speaking, consumers in the areas of large undertakings are almost equally well served by either form of ownership. The companies have set an example in competent management and have been influenced by municipalities in their charges to consumers, particularly those of the domestic class.

Mr. Lamb considers that while public ownership of all electrical utilities will inevitably evolve, municipal ownership is unlikely to provide a permanent solution owing to the limitations of local government boundaries.

The Regulation of Undertakings

IN describing the public regulation of private electric utilities, Mr. J. C. Dalton (manager and secretary of the County of London E.S. Co., Ltd.) traces the development of company- and municipally-owned undertakings side-by-side. There are 371 municipalities, three joint electricity authorities, five joint boards and 252 companies. The principal reasons for the less substantial development of the last named are (1) the discouragement of private enterprise under the limited tenure of twenty-one years permitted under the first Electric Lighting Act, and (2) the first claim laid by municipalities to most of the larger towns in the earlier years. He pointed out that, while the two groups are not competitive, there exists a natural rivalry to show the best results. The method by which companies are authorised to supply, either by Special Order or Act, the operations subject to regulation by the Electricity Commissioners and the functions of the Minister of Transport are briefly set out. The Minister is empowered to revise maximum prices, but it is shown that as these bear little relation to the prices charged this legal provision is of little value to disgruntled consumers.

The more modern practice of associating dividends with rates charged to consumers, as in the case of the London companies, is discussed. Mr. Dalton refers to the position of the regulatory bodies in regard to private utilities as one of benevolent supervision. The confidence shown by the industry in them is due largely to the manner in which they have been set up and the independence which Parliament has given them. The companies abide loyally by the decisions of the Commissioners with the net result that a reasonable return to shareholders is accompanied by decreasing charges.

Power Companies' Handicaps

MR. W. B. WOODHOUSE (managing director of the Yorkshire Electric Power Co.), after a brief historical survey of the conditions in which the industry has developed, shows that the Power Companies Acts failed to remove all obstacles to the supply of electricity over wide areas made possible by technical progress. The most densely populated districts were excluded from a power company's distribution area and the undertakings there continued to operate independently. In one case two-thirds of a population of three million lived in less than one-fifth of a total area of 1,644 sq. miles, in which the company was debarred from operating, and this increased the difficulty of supplying the remaining area.

The power companies are prohibited from supplying energy for lighting only, owing to the mistaken view of the legislature that private distribution undertakings would be set up for that purpose. Again, tenure is only secure in respect of bulk supply powers, leaving uncertainty regarding the future granting of powers to other bodies for distribution.

Mr. Woodhouse claims that company ownership of undertakings has advantages of management that derive from incentive of profit, continuity of policy and ability to make rapid decisions to meet rapid changes due to engineering progress. In the electricity supply industry annual revenue is only about 15.7 per cent. on the capital, which after allowing for reserves and depreciation gives 3.7 per cent. on the capital for division as profit. This profit, however, is over 23 per cent. of the selling price. In the past municipalities raised capital more cheaply on the security of the local rates, but as the stability of the company undertakings has increased, especially where there is reasonable security of tenure, the difference between the credit of the two classes is, it is suggested, outweighed by other considerations.

The granting of a more secure and uniform tenure to the various companies coupled with provisions for a fair return on capital expended in carrying out their statutory obligations would permit simplification of the financial structure of holding companies and greater assurance against undue intermediate profits.

While the reduction in the number of individual undertakings by grouping them into regional organisations presents advantages, the large participation of municipalities in the business and the limited security of tenure of distributing companies stand in the way of further development by private enterprise.

Distribution Problems

EARLY in his paper in Section VI (Rationalisation of Distribution) Mr. J. R. Beard gives some "preliminary data" relating to electricity supply in 1934-35, a year later than the most recent volume of the Electricity Commissioners' statistics. These show that since the issue of the latter, certain trends have been continued. Thus the number of undertakings has declined from 643 to 629, these serving 86 per cent. of the total area of Great Britain and 99 per cent. of the inhabitants. The total of connected consumers had increased by 789,000 (compared with the 772,000 in the previous year), which is double the figure recorded five years ago. Over 80 per cent. were domestic, but as the number of houses is 11½ million, this means that less than half had an electricity supply.

Of the 13,029 million kWh sold, nearly 35 per cent. was for lighting, heating and cooking, and 56 per cent. was for power (approximately the same proportions as in the preceding twelve months). Consumption per head of population had risen from 253 to 286 kWh, of which 100 kWh was for lighting and domestic use. The number of persons employed had increased to 80,800 compared with 74,783 in 1933-34, which was 4,400 above 1932-33.

Figures are not available for 1935-36 except that the output increased by 15 per cent., and reached 17,567 million kWh in 1935, in addition to which it is estimated that 8,000 million kWh was produced by private and traction plants, equivalent to sales of 480 kWh per head.

Tables of statistics are included for different types of undertaking showing growth of consumption for twelve years, revenue, voltages and systems. In one table seven years' costs are analysed; these show that while the proportion of distribution cost to the total (including capital charges) advanced during this period from 42.7 to 49 per cent., kWh sold per consumer fell from 2,693 to 1,877 and per £1 of distribution

capital from 55.58 to 50.12. Improvement in transmission and distribution costs was from 0.723 to 0.657d. per kWh as against from 0.830 to 0.605d. for generation.

In a section relating to domestic tariffs, Mr. Beard suggests that too much importance has been attached to securing that each consumer pays the actual proportion of fixed charges in giving the supply—a view that does not obtain in other utilities. It should be practicable to require undertakings to offer a two-part tariff based on rateable value or floor area, at the consumer's option. He sees advantages, however, in a tariff in which a definite number of kWh is charged for at a high rate (instead of the fixed charge).

Rural consumers, he held, are not on the average, much more expensive to supply than urban consumers, the cost of longer mains being largely offset by lower costs of overhead construction, and the example of the postal and telephone services in avoiding rate differentiation might generally be followed.

While distribution costs decrease inversely with the size of the undertaking the grid has altered considerably the efficient size of undertaking as a small concern can now purchase electricity at a price that enables it to secure large industrial loads. From the technical point of view, an area of 50 to 100 square miles is large enough for efficiency, though the best size is regarded as being from 1,000 to 3,000 square miles of combined rural and urban district. Distribution tends to be an extensive process, like communications and transport, while generation is an intensive one like manufacturing; hence the possible percentage reduction in the cost of the former is likely to be less spectacular than it has been in the other case.

There is general agreement as to the best technical system of supply, *i.e.*, transformation in main sub-stations from the transmission voltage to 11 or 6.6 kV for large power consumers or for transforming centres supplying low-voltage networks and 11 or 6.6 kV to 400/230 V three-phase four-wire for distribution to smaller consumers.

The ideal aimed at is that low-voltage networks fed from a transforming centre should be normally self-contained but with emergency connections to adjacent networks.

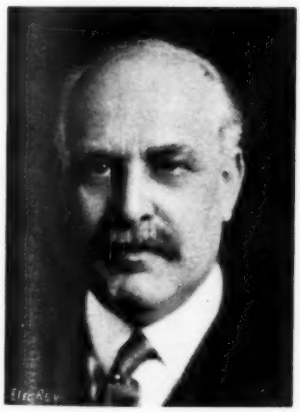
Size and spacing of transforming centres should depend on load density of the area supplied with initial provision for increasing the number rather than the capacity of the transforming centres.

Science and the Community

Three presidential addresses at the British Association meeting

IN his presidential address to the British Association for the Advancement of Science, at Blackpool on Wednesday, Sir Josiah Stamp discussed "The Impact of Science upon Society," that is, the way in which changes brought about by science are affecting the social organism, whether the transitions are easy or painful; the solution of the problems thus created calls for a new scientific technique.

Science, he said, has usually no immediate impact upon institutions, philosophies of government and social relations, but its effect on people's numbers, location and habits soon has. Instances of this are the applications of electricity and local transport which make areas of local administration inappropriate. Resistance to changed needs by institutions may react unfavourably on scientific enterprise.



[Elliott & Fry

Sir Josiah Stamp, this year's president of the British Association, is a well-known economist and is, among other things, the president of the L.M.S. Railway Co.

Industry is now far more amenable than formerly to scientific influence and the proportion of developments in which the initiative comes from the business end is increasing. Few scientists have quantitative ideas as to the disturbing consequences of their work, although keenly aware of its beneficial effects, while statesmen and administrators are rarely trained to prepare for adjusting society to rapid scientific advance. The functions of government begin only when a vested problem exists. The crucial impact is nobody's business. There is a neutral field in which the specialist scientist and the politician are both amateurs; this field remains to be covered by each extending his studies and by specialists who treat impact and change as an area of scientific study.

Three features of the impact must be dealt with under any form of society—man's abilities, his affections and his tools. In the changes induced by science two important factors are the "balance of innovation" and "the safety valve of population." Changes that save work reduce costs, releasing purchasing power and labour for other purposes; dislocations so caused can be made good by a due balance of new labour-creating commodities.

Increase in population, especially if accompanied by an extension of territory, tends to redirect displaced labour and capital from declining industries to new products. In western industrial countries, however, population is tending to fall and the impact of science is likely to be more severely felt because changes of direction cannot be absorbed by new-directed workers. Moreover, as the average age of the population is increasing, inflexibility to change increases.

The amount of net "technological" unemployment, however, is often exaggerated. If a million people are unemployed in "good" times, probably no more than 250,000 are so due to scientific innovation, most of the balance being due to other causes such as changes in fashion, exhaustion of resources, differential growth in population, and psychological depressions of trade due to monetary disturbances.

Technological unemployment may be represented as the cost to society of a greater promptness of accessibility to novelty; with the addition of the capital thus put out of action, the price is probably about 3 per cent. of the national income. However, even if the aggregate individual advantage of adopting some novelty exceeds the social cost of sustaining the unemployed, the moral effects of unemployment may make it unsound.

Uneconomic rapidity of innovation is not the only problem; there is, on the other side, improvident tardiness, as unless discoveries are profit-making, their potentialities are generally unexploited. On the other hand, the literature of socially responsible planning deals mainly with the known, and seems to be little better than quasi-individualistic methods for introducing the results of new research and for dealing with the social impact—unemployment, redirection of skill, location and the breaking of sentimental ties that distinguish men from robots. By neither means can it be certainly known in advance what will succeed in public demand.

Delight of discovery has led to the neglect of problems of arrangement and absorption of the things discovered and too little attention is being paid to research upon physiology, psychology, economics and sociology, compared with that given to the applied sciences, the expenditure upon which is up to ten times as much; leisure is almost unexplored scientifically.

The human race has shown itself to have a much wider range of adaptability than was once supposed; *e.g.*, speeds of travel once hardly bearable are now common. There can be little doubt that, with the right applications of experimental psychology and adjusted education, the mind of man would become still more adaptable.

Economics, which has confined itself to the known world, is inadequate as a guide, since its basic postulates are being rapidly changed. It is now engaged in modifying old structures to meet new conditions, but now, when elasticity is most wanted, stability leading to rigidity has become a fetish.

If the impact of science brings certain evils, these can be cured only by more science. Ordered knowledge and principles are wanted everywhere—in man's work, health and moral responsibility. The systems of to-day are rooted in the relations between individuals, but society to-day is permeated with corporate relations; thus the accepted code of ethics of a joint stock company may but faintly resemble that of the individuals comprising it, as these are not only influenced by financial considerations. The whole body of ethics needs to be reworked in the light of modern corporate relations.

The shortcomings of the active world are the shortcomings of science. The duality which puts science and other activities in contrasted categories with disharmonies to be resolved is unreal. The greater our success in the science of matter, the greater must be our failure, unless we turn to an equal advance in the science of man.

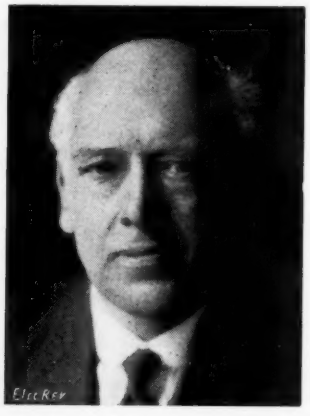
The Engineer and the Nation

That science, as represented in its applied form by the engineer, should be the greatest instrument in civilisation

that the world has ever known was also a theme of Professor W. Cramp's address as president of the Engineering Section delivered yesterday.

He showed how the function of the engineer is to use the co-ordinated knowledge of the pure scientist and the experience of the ages to the satisfaction of human requirements; this implies a need to understand human psychology.

Three-fourths of the work of the engineer is devoted to the development of communications—roads, railways, telephones and telegraphs, to mention a few—all of which would tend to promote understanding between individuals and nations, if they were not misused by others.



[*Lafayette*

Dr. W. Cramp, the president of the Engineering Section, is professor of electrical engineering in the Birmingham University

The engineer has been accused of lending himself equally to works of utility and of destruction; there is, however, no scientific apparatus that cannot be misapplied. He is charged with some responsibility for the economic chaos; but the invention of a labour-saving machine does not compel its use, and to rid the world of machines would require a love of monotonous work for its own sake.

In any community the status of an individual should depend upon the extent to which his occupation is fiduciary, the measure of responsibility incurred and the nature of services rendered. The responsibility of the engineer is generally greater than that of the medical practitioner, as his mistakes may have more serious consequences and he has the liability without the status, where members of the medical and legal professions are shielded largely from liability but have the status in addition to far greater remuneration.

The deficiencies of engineers themselves and of trade associations are dealt with and certain reforms are recommended in the interests of both engineers and of the public. These include the setting up of a body, with statutory powers, to define the qualifications of all entitled to call themselves electrical, civil or mechanical engineers, in order to prevent unskilled persons from jeopardising life, and to check unprofessional conduct, but not to secure immunity from liability.

A second point is the proper representation of science upon all governing bodies in industry and technical departments of the State, for instance, the Board of Admiralty. In the interests of the life and health of citizens, Government and municipal bodies should be prevented from allowing engineers to be over-ruled on technical points by the commercial men.

A fourth reform advocated is the appointment of a Royal Commission to investigate the need for a drastic alteration of patent procedure in the law courts. It is also suggested that trade associations should include in their councils representatives of contractors and buyers.

In conclusion, Professor Cramp urges that colleges should aim at giving their students a real perspective of life, in order that they may place integrity above self-interest, and thus assist later in improving the professional code.

The Chemist's Position

Professional status and its relation to the public needs was likewise the text of the president of the Chemistry Section, Professor J. C. Philip, in his address on "The Training of the Chemist in the Service of the Community." He referred to the recent advance towards this end by the formation of the Chemical Council, which is based upon the three chartered organisations—the Chemical Society, the Institute of Chemistry and the Society of Chemical Industry—and emphasised the importance of founding the proposed undergraduate course in chemical engineering on the fundamental principles of physics and chemistry.

Professor Philip joined with the other presidents in deploring the perversion of the discoveries of science to destructive ends and concluded his address with an expression of belief that the main problem before all civilised nations was not the meeting of technical requirements (which could be done sooner or later), but the wise use and distribution of the abundant products of science.

Television Receivers

Several makers in the field

THE prospect of a regular television broadcasting service from Alexandra Palace has encouraged a number of companies to commence the manufacture of receiving sets for public use. At present the prices are necessarily very high, and while it is doubtful whether they can ever be really low, increased production will have its effect in due course and enable an ever-growing circle to become "lookers-in" or "televiewers."

With the exception of one maker's models, all the new receivers depend for their operation on the cathode-ray tube which, in the form of the oscillograph, has become familiar to electrical men. In brief, the tube is a cylindro-conical envelope with the broad end made as flat as possible. The cathode when excited by a suitable voltage emits a beam of electrons which impinges on the flat end in the form of a small spot. The tube end is coated with a fluorescent powder which converts the ultra-violet radiation into visible light. By means of electrodes the beam is diverted electrostatically in the vertical and horizontal directions, the deflecting voltages being generated in a "time base." The brightness of the scanning spot varies according to the transmitted picture signal, thus providing the black and white and intermediate half-tones. The spot moves at incredible speed over the front of the tube to form the "picture."

At the G.E.C. Research Laboratories, Wembley, last week it was explained that the company's television receiver consists of a sound and vision chassis which amplifies both types of signal and supplies the picture-frequency voltage and synchronising impulses; a double-time-base chassis containing gasfilled relays, which work as l.v. relaxation oscillators and provide the "saw-tooth" voltages for deflecting the scanning spot; a power pack for providing the operating power; and the cathode-ray tube assembly.

The controls include a multiple on-off switch for effecting the change of circuits in passing from one system to the other; a tuning control; a means of modifying the picture contrast; lock controls (horizontal and vertical) which maintain synchronism; and sound volume, brightness, amplitude, focus and picture-size controls.

The equipment is housed in a handsome walnut case. The large end of the cathode-ray tube is set at a convenient angle and the picture size is 9 in. wide by 7 in. high—the tube end being 12 in. in diameter. The company has two sets: one for vision and associated sound only and the other for the reception of all-wave broadcasting as well.

Ferranti, Ltd., are making two types, one a vision and sound set and the other an all-wave radio receiver. Both systems of transmission are catered for, the change-over being effected by a switch. The sound receiver is equipped with automatic volume control, and for the picture brightness and contrast controls are provided. The viewing screen measures 7 in. by 9 in.

Showing the arrangement of the G.E.C. sound and vision set

A picture 10 in. by 8 in. is obtained with the Marconiphone "701" set, which is, in addition, an all-wave receiver. The 9-in. "Emitron" cathode-ray tube is mounted vertically in the cabinet, and a mirror in the lid at an angle of 45 deg. reflects the picture straight out into the room by way of a lens.

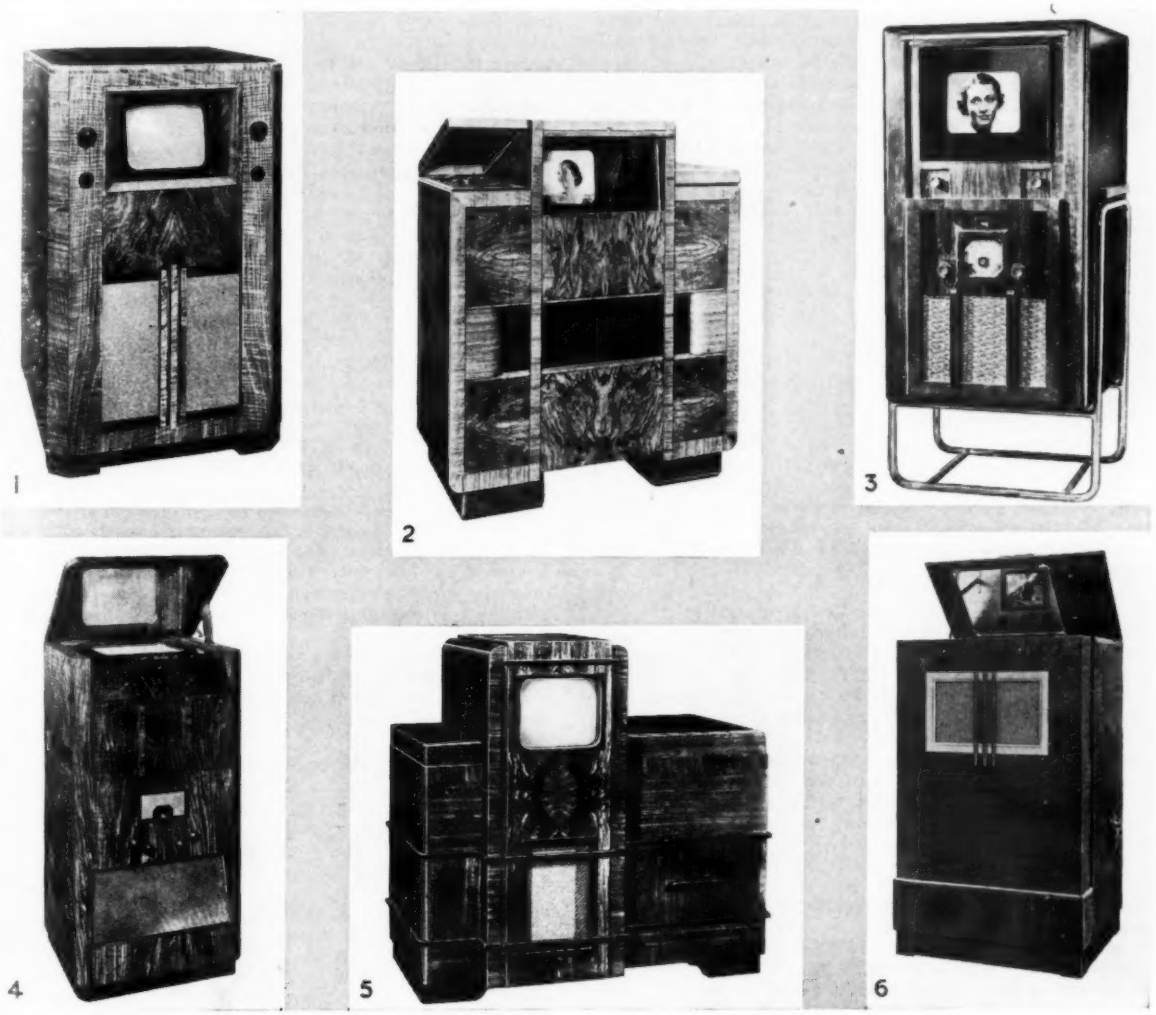
The company's ordinary sound and vision set—the "702"—has an "Emitron" tube 12 in. long. This is used in conjunction with a mirror (but no lens) to give a picture measuring 9½ in. by 8 in. As in all the other models, the sets are suitable for both 240-line and 405-line transmissions.

Pye Radio, Ltd., is also producing two sets. The sound and television receiver is semi-permanently tuned to the picture and sound wavelengths, provision being made for fine adjustments, the change-over from one system to the other being effected by a switch. The sound receiver has a response of from 50 to 15,000 cycles per second, the speaker being of the "duode" type. The company's other set combines the sound and vision receiver and an all-wave radiogramophone with an automatic record-changer.

Three models of the "Televisor" receiving set are being manufactured for Baird Television, Ltd., by Bush Radio, Ltd. These are designed for operation from either of the gramophone, long-wave band, medium-wave band, television-sound only, and television with sound. Volume control is also provided for all functions.

The company's model "237T" is identical, with an additional upper section containing an automatic record-changer and gramophone pick-up.

The Philips set employs a 12-in. cathode-ray tube giving a picture measuring 8¼ in. by 7 in. The apparatus is built on the unit system, and the cabinet is mounted on a chromium-plated steel stand which places the television screen slightly above the eye-level of a seated observer. In this way, it is claimed, correct height is obtained, while too



Examples of the New Television Receivers

1. A G.E.C. set. 2. Marconiphone "701." 3. Philips. 4. Bush Radio. 5. Pye, with radiogram. 6. Ferranti all-wave model

two high-definition systems of ultra-short wave transmission from Alexandra Palace within a radius of about forty miles from it. The first model, "T5," gives a 12 in. by 9 in. picture on an inclined mirror mounted at an angle of 45 deg. to the top of the "Cathovisor" cathode-ray tube. The latter is mounted vertically in the cabinet, and is protected by a window of safety glass.

Five chassis units with twenty valves (including two mains rectifiers) of an aggregate capacity of 240-W are included. Main controls are: On-off, picture focus, sound-volume, picture brightness, vision control, picture contrast and common tuning. Below the controls is mounted an energised moving-coil loud speaker.

The "T6" model is generally similar to the foregoing, but it is designed to receive programmes on medium and long waves, and to show a picture 10 in. by 7½ in. Fourteen valves are employed, requiring 160 W. The third type incorporates an all-wave radiogram.

A picture measuring 10 in. by 7¾ in. is given by the Cossor television receiver, and, in common with the other makes, simple provision is made for switching over from one system to the other. The set is also an "ordinary" broadcasting receiver, and provision is made for a gramophone pick-up. The controls permit the simultaneous tuning-in of the sound and television signals and adjustment of picture contrast. There is a six-way switch having the following positions: Off,

massive an appearance is avoided. There are only two controls—one for varying the brilliance of the picture and the other for changing over from 405- to 240-line transmission.

The eight-valve superheterodyne sound receiver covers the normal broadcast bands in addition to the television sound signals. The scanning system is double-electrostatic, and uses three valves for the horizontal scan and three for the vertical. High-vacuum valves are used throughout the scanning system.

A "straight" circuit is used for the sound receiver in the Halcyon Radio set, but the vision is dealt with by a superheterodyne system. The end of the cathode-ray tube is protected by a sheet of plate glass, and a picture 8 in. by 6 in. is provided. Gasfilled relays are used in the two time bases.

The Ekco-Scophony receiver differs from all the rest, having no cathode-ray tube. The scanning system is mechanical, involving the use of two mirror drums, the first of which is only about half an inch in diameter by 1¼ in. long, the other being a 20-sided drum about 2 ft. in diameter. The operating principal depends upon the variation of light passing through paraffin in a little trough one side of which is formed by a piezo-electric crystal. A picture measuring 16 in. wide will be given by the "home" set, but projectors are being evolved which will provide a 12-ft. picture. A set capable of projecting a 4 ft. 6 in. picture on a screen has already been produced.

The Station Man's Prospects. By Power Engineer

Which branch should the aspirant choose?

ONE is often asked: "In choosing a career in the electrical industry, which section would you advise a newcomer to take up?" Can this question be answered satisfactorily under present-day conditions?

Only a few years ago the answer was comparatively simple. Apart from the manufacturing side, one had only to decide between the power station or distribution sections, both of which followed straight defined courses. On the power supply side, one which concerns me most and of which I speak with experience, one normally started as a volt boy or very junior switchman, receiving a nominal wage in return. After a certain period, depending on ability or fate, one was able to obtain a position as a switchboard attendant.

Whilst in the junior capacity facilities were always present for getting well acquainted with engine-room and boiler-room operation. This was a great asset and did much to help one on to another rung up the ladder, above that of switchman, to charge or shift engineer. There were few intermediate grades between switchman and engineer in those days as the station capacity did not warrant it. Assistant shift engineers were unheard of. In fact, in quite a number of undertakings the engineer was also the switchman, and sometimes his own driver. With the rapid progress of the industry vacancies for "chiefs," "deputy chiefs," and senior assistants sprang up, and were soon filled by many of the men who were then charge engineers.

Effects of Displacement

So much for the older men in the industry, but what of the comparatively young men, who have now reached a point where they wonder if progress still exists. Promotion is now very slow; displacement of the staffs of the smaller undertakings has put on the labour market men who are now quite prepared to accept jobs junior in grade to their previous positions—jobs which may carry as much, if not more, money than they received previously. Naturally, these men have better qualifications and practical experience than the younger men.

Another condition is brought about by the specialised nature of power station work. Nowadays in a moderately sized station there is a station superintendent with his chief assistant. Then follow an electrical superintendent, a mechanical superintendent, a boiler-house superintendent, a test engineer, a control engineer, and a charge engineer. Under these are a control-room attendant, a turbine-room engineer and boiler-house engineer, and various assistants who hope at some time or other to get their seniors' jobs, but when the opportunity occurs are invariably disappointed, because the powers that be decide to employ an outsider. Of course, there is also the station chemist, but this position is completely isolated.

For the various jobs outlined the rates of pay are fixed after the first four years. This is a condition which has only just been introduced, and which drew forth considerable comment from various members of the staffs concerned. Prospects of increase in pay are likely in the event of the plant capacity being increased, but this increase must be 50,000 kW in the higher-class station, and at present is only covered to a maximum of 250,000-kW total capacity.

How Can Experience be Gained?

Consider, for example, the case of a control-room attendant (switchman); can he become a control engineer? Control engineers are usually recruited from the ranks of charge engineers as some general knowledge of power-station operation is essential, particularly where load despatching is carried out as well as switching. A man in the present position of switchman may, if he is efficient at his job, be given a chance as an assistant to the turbine-house engineer, but it is doubtful if this will be other than with the authority for which he is already working, as most employers require as an essential qualification previous experience in turbine operation.

Where or how can he acquire this experience? Text-books and schooling may help, but *some* practical experience is essential. In his present position he will obtain practical knowledge of electrical gear, but this will not go far in assisting him to trace lost vacuum, for instance. Here, then, we have reached a point of stagnation.

As another example, take the position of the men now engaged as turbine or boiler house engineers. These men may, or may not, rise to be superintendents of their respective departments, but can hardly expect to obtain situations as charge or shift engineers, as their knowledge of the heavy side of electrical engineering will be rather scanty and insufficient to enable them to supervise work carried out in the control room and attendant switchgear. These men, therefore, will remain at this stage without much prospect. Perhaps, in a few unusual instances, they may land jobs in smaller undertakings as chief assistants. This is rather remote, as few have the necessary qualifications, and it rather applies to men who at an earlier date had actually been in charge of a small station before taking up the more remunerative position in a station of larger capacity. Men of this type will be more scarce as time goes on, due to the smaller stations being superseded and swallowed up by the larger plants now operated under the direction of the Central Board.

The position of the charge engineer (a title which, before long, must surely become defunct) claims our attention next. The grade or position, whichever you care to term it, must always remain, as it is imperative that one person should be responsible on shift to ensure collaboration of all the operating departments. A better term, or title, probably would be shift operating superintendent, and if it ever comes about this will present the E.P.E.A. with another anomaly under its schedule with consequent further revision.

From which section, and with what qualifications, will employers expect these vacancies, when they occur, to be filled? We all know that familiar phrase: "Experience in the operation of boilers, turbine and control of large power areas essential." How does this become possible if employers are not prepared to give men with only a little experience a chance in their earlier career? The men in the big positions to-day are men who have grown up with the industry, men who could only step into the jobs because of their past experience in the smaller stations. The demand, until a year or so ago, exceeded the number of persons available, so rapid has been the growth of the electrical industry. These men can hardly review the conditions of to-day in the light of their own progress and experience, as the circumstances are certainly not comparable.

As time goes on, this condition will not necessarily improve, unless more chances and better prospects are offered to the younger members of the industry. What enticement is there to any of the younger generation to take up power station careers when the prospects are so doubtful and the chances of promotion to anything worth while so remote and unestablished?

Why should they work amongst dirt and grease and in such a noisy atmosphere, when they can do as well, if not better, and be in more pleasant surroundings, by taking up jobs on the distribution or sales side?

Possibilities on the Sales Side

We are not all potential salesmen, but the prospects make it worth while trying, and trying hard, to be such. The salary is generally good, with annual increments and usually a bonus on sales. All this makes the position look more rosy to newcomers. Even a salesman has the prospect of rising to a really good position, particularly now that the companies and municipalities realise the advantages of selling their own apparatus.

Of the three sections taken, I think it must be agreed that the power station man has the greatest responsibility, although, perhaps, the salesman's job is rather more precarious. Financially, I doubt if there is much difference, taking into account years of service, &c. The majority of outside men are sure of an annual increment which, after a year or so, amounts to a considerable increase in the initial salary. For the power station operating staffs, there are no annual increments, nor is there any tangible appreciation when the sales and units generated show gigantic increases, as is the case in this prosperous industry at present. The power men are all on the costs side, they are the necessary evil, whereas sales and distribution bring in the money, they sell the "juice" and are consequently looked upon more favourably.

Shiftwork also is another deterrent to newcomers, and adds to the difficulty of answering the original question. Distribution men will probably answer that their hours are bad and uncertain, but with properly organised duties and routine. I doubt if many of them lose much sleep over the thought of being called out in the dead of night to attend to local failures, &c. Many may say "To what ambitious heights can we rise?" Well, I have known junior distribution men attain the position of area superintendents, also cases where others have become mains engineers. Both these jobs, it must be admitted, carry good salaries in most undertakings. The salient point about a distribution career is that there are not a number of side tracks into which one may drift, only to find, when it is too late, that they are blind alleys.

Still, like married folk advising single persons to remain single, so we shall have power station men advising new entrants to take up a career on the distribution side, only to find them doing the reverse, if only for the delightful uncertainty of it all.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Penalising the Industrial User

Your correspondent "Watch" wishes to know the net rateable value of the house mentioned in my article. It is £33.

A point which I feel has not been clearly made in the comparison is the vast difference in distribution costs between supplying 1,300,000 kWh per annum at 11,000 V to one consumer and supplying the same amount of energy at 230 V to about 650 different houses. The relative costs of the mains material, laying and maintenance, are incomparable. Further, the work of meter reading, accounting and account rendering must increase in proportion to the number of consumers. S. A. STRODE.

Neston, *August 31st.*

Is Water-power Development Justified?

With the coal industry in its present precarious position it seems only fair that the promotion of water-power schemes should be discouraged. Low-priced electricity would be obtainable by means of steam stations if such stations were erected in the coalfields, even if these stations functioned independently as condensing stations. Energy would be still cheaper if produced in conjunction with other industries requiring plenty of medium-temperature heat.

As one who knows the Glenmoriston district I fail to appreciate how the proposed Caledonian Co. undertaking can hope to generate cheap electricity from the proposed scheme in that glen. The capital outlay involved will be heavy in comparison to power yield. It will probably be five years before a supply of current can be made available, whereas, if it is of national importance that we become producers of carbides, a steam station and factory could be in operation in a relatively short time. The scheme will no doubt receive the fullest support from civil engineering contractors and a few fanatical Scottish Nationalists. It will be opposed by the landowners, but it should be opposed by all who have the future of our coal industry at heart. G. COPELAND.

Hursley, Hants, *September 4th.*

Electrical Fatalities

The number of fatalities caused by the misuse, or bad installation of electrical work is obviously on the increase, especially on domestic or similar premises.

Electrical accidents reportable under the Factory and Workshop Acts numbered 447 in 1935, of which 23 were fatal, the total having risen during the last ten years. In the past year 20 non-fatal accidents happened to women on the undernoted apparatus:—Two involved switchgear operating at less than 650 V; four portable electric machines; two portable heaters and irons; one a fixed lamp; two plugs and adaptors; four cables and flexibles; four testing apparatus; and one other apparatus not detailed.

Amongst skilled workmen, electricians and jointers, there were 138 electrical accidents, three being fatal. Supervisory staff incurred 31 accidents, one being fatal, with numbers amongst sub-station attendants, testing staff, fitters, erectors, &c.

How many of these electricians and jointers were really skilled men? And how many were of the type mentioned by Mr. Milne in the letter published in your issue of August 28th, who are obviously a menace to the industry and to themselves, as well as others. I have had to mount a board and cut-outs between the piers of a scullery sink, where a woman, and possibly children, had to stand to perform washing up duties, and mount them in a lavatory adjoining a washhouse subject to extensive steam on a wash-day.

It is a wonder that there are not more fatal results. Is the earthing of a 75 kVA air-cooled transformer with the aid of a piece of 7/20 wire, engineering practice? Where are the Government Inspectors?

It is a common habit to employ inferior workmen, who have little idea of what they are doing, and as it is a practice of some contractors to have some form of piecework or gallop system on installations there is bound to be slip-shod work.

I know one electricity department which gives out its assisted wiring work to contractors, who may, or may not, be registered. On going into the false roof of a house I found that the wire was slung around anyhow; temporary wiring on a ship in course of construction was a neat job in comparison. The consumer was expected to insure against fire risk, I rather think he would have done if he had known what was under his slates.

Nothing will eliminate the pests but an Act of Parliament to prohibit unqualified individuals from tampering with installation work, on similar lines to that in the southern hemisphere. It is up to the N.R.E.I.C. to put its house in order, and combine with the contractors' associations and trade unions to secure the elimination of the delinquents upon both the workers' and contractors' sides. CAIRNGORM.

August 31st.

Electricity claimed 87 lives during the year 1935, a number that will probably increase as each year passes. Of these, only 23 were reportable, and this, I would suggest, is the snag. Electrical fatalities in non-industrial premises are not, in ordinary circumstances, reportable to either the Ministry of Transport or the Home Office. The householder then, is only protected by the Electricity Supply Regulations 1934, which *enable* supply undertakings to refuse connection to premises in which the installations are not in accordance with safe practice.

A recent view of Boulder Dam, one of the generators of which was to be started up by President Roosevelt during the proceedings of the World Power Conference

As the law stands at present, the supply authorities may please themselves whether they test installations or not, and since their main object is to *produce* electricity at the cheapest possible rate, they cannot be held responsible for the inspection of installations. It is, therefore, up to Mr. Milne and others who are interested in this important matter to acquaint their respective M.P.s with all the facts, and urge them to use their influence to bring about compulsory inspection.

Accrington, *August 31st.* JOHN F. BRIDGE.

The I.M.E.A. and the MacGowan Report

In the September issue of the *Journal* of the I.M.E.A., there appears a paragraph of more than ordinary interest to many readers, *viz.*, "The Council also considered the verbal request regarding the circulation of the evidence which it gave before the MacGowan Committee, and after very careful deliberation came to the unanimous opinion that no good purpose would be served at this juncture by circulating the evidence to members."

Whatever diplomatic reasons existed for withholding the information at the time of the request, the release of the MacGowan Report has removed many of the grounds of objection, and some better explanation than this seems to be due to the ordinary members of the I.M.E.A. Surely there is a desire on the part of the Council to act in accord with the wishes of the majority of ordinary members—even though they merely represent small undertakings—particularly as their affairs have seemingly been handled to their disadvantage.

At Bournemouth in 1935 municipal and company supply authorities were invited to attend a National Electrical Convention together with the contractors, under the banner of

co-operation, in order to discuss such things as standardised voltages, systems, installations, appliances, fittings, etc. Arising out of the discussions various recommendations were considered at the I.M.E.A. annual general meeting, but nothing of importance emerged and the consensus of opinion was that the experiment ought not to be repeated; it had not achieved anything of note or disposed of standing differences.

A few weeks later, however, there was an exaggerated claim by the I.M.E.A. that the Conference had expressed itself entirely in favour of co-operative action and the sanction of the Council had been given to undefined proposals to reduce the number of supply authorities. In the following month, the MacGowan Committee was appointed to consider the ways and means of carrying out the undefined proposals. At a later date the Council laid evidence before the Committee, and beyond an assurance that the interests of municipal authorities would be carefully watched, I am not aware that there was any attempt to call an extraordinary meeting in order to ascertain the feelings of the members.

Judging by the nature of the major recommendations of the Committee, the evidence submitted would not appear to have influenced the findings by so much as a single comma, and having, no doubt, acted for the common good, it is difficult to understand the Council's disinclination to come out into the open and let everybody hear the good things which, presumably, must have been said about the small undertakings.

It was unfortunate that the Report was published after the 1936 Convention, which prevented its coming up for general consideration and discussion at the annual meeting.

It seems that we shall have to reconcile ourselves with the comforting reflection that the body and the tail of the municipal dog unduly hamper the progress of the head when racing to follow the Government hare, and, consequently, we shall hear little more about the evidence tendered by the I.M.E.A. regarding improvements and enlargements of the track.

Whitworth, *September 4th.* JAMES RATCLIFFE.

Why Standardised Tariffs?

"Variety," in his letter in your issue of August 7th, points out with a good deal of truth the justification for the present complexity of tariffs.

Is it not evident on reflection, however, that the real and principal object of all this variety is the encouragement of consumption during off peak periods and the discouragement of peak consumption—in other words, the levelling of the load curve? Multiple tariffs are merely an indirect and complex means of approximating to this ideal which can be more easily and correctly attained by making time of consumption the basis of cost. A time-basis tariff would directly encourage level load conditions by standardising a rate variable with respect to time and would remove the complexities and laborious accounting which results from multiple tariffs.

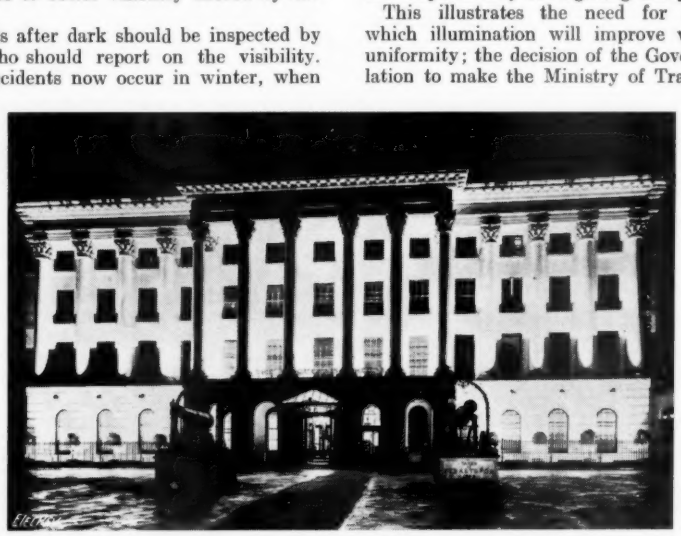
Nassau, Bahamas, *August 31st.* H. H. MANSON.

Reducing Street Accidents

THE annual conference of the Association of Public Lighting Engineers was held at Cheltenham this week. In his address on Tuesday last, Mr. E. C. Lennox, the president, discussed the relationship between the number of street accidents and the standards of public lighting in force.

Official figures, he said, indicate that most accidents occur in winter between 5 p.m. and 8 p.m. and in summer between 10 p.m. and 11 p.m.—hours during which the volume of traffic is considerably less than during daylight. An 81 per cent. increase of night traffic in August during the last five years on a typical main highway has been accompanied by a reduction of 39 per cent. in the number of night accidents—a result which is claimed to be due to better visibility offered by improved lighting.

The sites of all accidents after dark should be inspected by a public lighting official who should report on the visibility. About half of the total accidents now occur in winter, when vehicle miles are half of the summer figure, so that the winter accident rate is double. More than half of the winter accidents happen during dark hours, although the number of vehicles on the road is only about a third of that during the day and the average mileage is not more than a half, so that vehicle miles at night do not exceed one-sixth of those by day.



Several of the principal Cheltenham buildings have been floodlighted during the A.P.L.E. Conference. This picture shows the headquarters, the Queen's Hotel, illuminated in red and blue by "Osira" floodlights

More definite data from the United States gives a night traffic density on a highway in Cleveland at half of the day average, but show twice as many fatalities. On certain other main-traffic routes the ratio per vehicle mile is ten to one for fatal accidents and six to one for non-fatal injuries. The cost of lighting is estimated at one-third of the economic loss due to preventable accidents. At Detroit the ratio of night to day accidents was doubled when lighting was curtailed by 35 per cent. to save not more than 15 per cent. of the annual costs.

In Great Britain the annual cost to insurance companies of motor vehicle insurance is £25 million. The present cost of public lighting is £5 million per annum; if this were increased by half, *i.e.*, 10 per cent. saving in insurance, illumination could be doubled.

In the 5,600 sq. miles served by the North-Eastern Supply Co. there are 124 authorities whose units vary from 40-W (400 lumens) to 420-W discharge lamps (18,000 lumens) and the lighting seasons from 810 to 3,820 hrs. per annum. Although the wattage per post has increased by 30 per cent. in the last five years, the average is still less than 100-W—the chief difficulty being that the rates levied for street lighting are generally between 9d. and 1s. per £1 of rateable value with a maximum of 1s. 10d.

Much of the traffic using the roads in these areas emanates from large towns, the inhabitants of which pay no more than 5d. per £1 for the whole of the lighting there. Apart from the financial difficulty each parish, as well as the boroughs and urban districts, is a potential lighting authority with its own ideas as to the type of lighting required. Benefit has been obtained through the rural district councils undertaking the responsibility for lighting the parishes in their areas.

This illustrates the need for larger authorities without which illumination will improve very slowly and will lack uniformity; the decision of the Government to introduce legislation to make the Ministry of Transport responsible for the maintenance of 1,500 miles of through traffic routes is therefore welcomed, since maintenance must be held to include lighting adequate to enable motor cars to dispense with their head lights.

Mr. Lennox agrees with those who hold that at the low intensities prevalent in street lighting, contrasts are sharper and objects more quickly detected in light that is almost monochromatic than when the spectrum is continuous. He believes that lighting authorities should own the installations in their areas as they can thus obtain the benefit of improved light sources and fittings; moreover, they can obtain loans at rates of interest below those available to companies.

One of the benefits of the Departmental Committee on Street Lighting, Mr. Lennox hopes, will be the issue of a new Standard Specification which will refer to visibility (although at the moment this cannot be expressed quantitatively) and roadway brightness as a factor of visibility by contrasts. The use of the term "candle power" should always be qualified by such descriptions as "mean spherical," "mean lower hemispherical" or "directional" (generally in polar or isocandle diagram), and the value of lighting sources should be given in lumens or kilo-lumens.

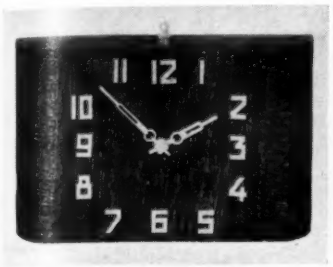
The greatest benefit from equipment available can be obtained only by the appointment of capable public lighting engineers as is done in the larger towns.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Battery Clock

The "Orel-Micro" clock, obtainable from OREL-MICRO ELECTRIC, LTD., 39, Berners Street, London, W.1, is driven off an ordinary torch battery. It is self-starting and has a four-jewel lever escapement; the current consumed is negligible, being approximately 0.0005 A. The size of the standard wall clock, which is available in mahogany, oak, walnut, green, black, blue, red, orange and grey finishes, is 9 in. in diameter by 1 in. deep. At slight extra cost white and ivory colours are available.



An "Orel-Micro" clock

A 5-A Fuse-plug

For the protection of radio and other low-load electrical appliances, LECTRO-LINX, LTD., 79A, Rochester Row, Westminster, London, S.W.1, has produced a neat "Clix" bakelite fuse-plug fitted with two easily replaceable clip-on fuses of from 1 to 5 A. It has one-screw assembly, with patent self-centring and non-collapsible pins.

A "Clix" 5-A fuse-plug

Electric Iron

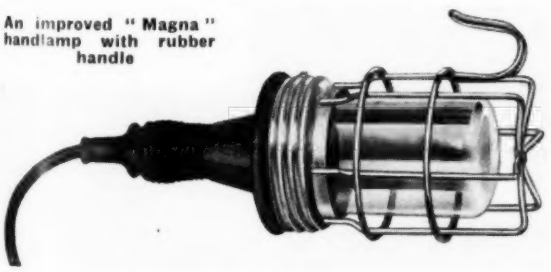
"R.E.A.L. Plus" is the name of a recently introduced electric iron of ROWLANDS ELECTRICAL ACCESSORIES, LTD., Hockley Hill, Birmingham, 18. It has a specially designed handle with a groove for the thumb instead of a thumb button, a chamfered base to facilitate ironing round buttons, and an asbestos lined wooden container arranged for coiling the flex around the outside instead of round the hot iron.

Nichrome ribbon hand-wound on ruby mica formers with nickel silver connecting strips comprises the element, the clamping plate for which is ground on the underside to ensure uniformity of heat distribution, while no asbestos packing or lagging is employed.

Handlamps with Rubber Handles

Several improvements have been made to the handlamps with flexible tough rubber handles supplied by the MAGNA WIRE & CABLE CO., LTD., 136, Borough High Street, London, S.E.1.

An improved "Magna" handlamp with rubber handle



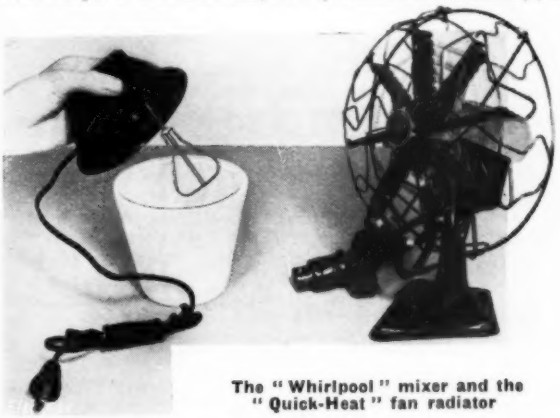
A nickel-plated reflector is incorporated inside the glass, which fixes tightly into the rubber rim on the handle, thus making the lamp water- and vapour-proof.

Wiring is simple and a single screw releases the lampholder, which is of steatite, and has a novel cable grip. A wire guard with a spiral thread and locking nut guarantees a tight fixing. The lamp is designed to take a 60-W bulb.

A Fan Radiator and a Low-priced Mixer

For bathrooms, offices, garages, &c., where quick or directional radiated heat is required, the "Quick-Heat" fan radiator marketed in this country by MESSRS. W. T. DRIVER, 10, Store Street, London, W.C.1, offers an alternative to other methods of heating. The fan, which is driven by a shaded pole induction type motor, drives air through a nickel-chromium "A" resistance wire, the total loading of the motor and element being 1 kW. The heater may be locked in any position in a 45 deg. vertical arc, and a heavy cast base prevents tipping. A black Morocco lacquer finish is used with gray enamel blades.

The "Whirlpool," a low-priced mixer and heater supplied by the same company, will find numerous uses in the kitchen. It is simple to use and clean, no adjustments are necessary; a button is situated on the top for starting and stopping the machine upon the slight pressure of the thumb. A one-pint transparent measuring pitcher is included with the mixer, together with a cover to avoid splashing.



The "Whirlpool" mixer and the "Quick-Heat" fan radiator

The 2,900-r.p.m. motor, which is of the induction type, is fitted with oilless bearings, with no brushes to adjust and causing no radio interference. The loading is 25 W.

A Non-agitator Washing Machine

Instead of relying upon an agitator for removing dirt the "Oxywash" washing machine manufactured by UNIVERSAL REFRIGERATORS, LTD., 201-211, Bishopsgate, London, E.C.4, incorporates a small 1/10-h.p. electric motor which forces a powerful stream of air continuously through the water. Actually the machine is better described as a wash boiler with an aerator, a 3-kW immersion type element (or gas heater) being incorporated; this fact is responsible for the price of the machine being approximately half of that of the agitator type of machine.

An "Oxywash" washing machine

Three types of machine are available, all of the 10-gal. size. There are the round model 2 ft. 6 in. high by 1 ft. 8 in. diameter, and a rectangular one 3 ft. 8 in. by 1 ft. 8 in., while a third (2 ft. 8 in. by 1 ft. 8 in.) is specially designed for fitting under the draining board. Black and white mottled enamel is the standard finish, but any plain or mottled shade can be supplied. The mottled grey enamel interior has corrugated protector plates, and there is a conveniently placed draining tap. Although hand wringers are generally fitted, electric ones are available at an extra charge. Special bearings obviate the necessity for oiling.

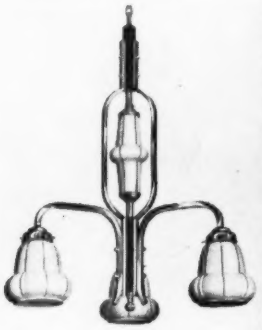
With regard to performance, the company claims that two to ten minutes is the time required for washing, according to the extent to which the articles are soiled, and that there is no danger of even the most flimsy garments being damaged. Articles may be put in or taken out while the motor is in operation.

Domestic Lighting Fittings

Several additional designs have been added to the "Finray" series of ceiling pendants available from MESSRS. L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, London, W.C.2, and there is a number of new adaptations of the "Panelstrip" fittings introduced earlier this year. Seven pendants, with three to five lamps, have the appearance of woodwork but are actually constructed entirely of metal, with "Crystaline"

glassware; one four-lamp model introduces a novel effect by having one lamp suspended above the other three.

Shadowless and evenly distributed illumination is a feature of two handsome four-tier semi-indirect pendants. They are finished in ivory and cream cellulose, the inside of the various sections being slightly tinted. "Honeycomb" glass shades are used for several bronze fittings of particularly substantial design, while "Shell Cup" pendants are available with three to six lamps. Spherical models and one with a representation of Saturn's rings are neat and effective.



Three new ceiling pendants supplied by Messrs. L. G. Hawkins & Co., Ltd.: A four-tier, semi-indirect model, an all-metal imitation wood fitting, and bronze pendant

Five wooden floor standards (5 ft. in height) are supplied in oak, walnut and mahogany, while there are no fewer than thirty different table standards. Designs with iridescent glass bases in various colours should be popular, figure, glass-ball, mirror glass and "Finray" models being other standards of particular interest. A novelty is a fitting which cannot be knocked over. The "Multilite" combined lamp standard and wall bracket can be had with bronze, cream, or green finish.

Kandem Motors

MESSRS. KANDEM MOTORS, LTD., 709, Fulham Road, London, S.W.6, inform us that a full range of Kandem motors is being manufactured in London. These motors are of the high torque a.c. squirrel-cage type, drip proof and screen protected. The terminal box is adjustable through 360 deg., permitting convenient wiring from any angle. The end shields are spigoted to ensure good alignment and all fixing holes are jig drilled.

The rotor laminations of low-watt loss are assembled under hydraulic pressure and securely keyed and locked on the steel shaft. Hard-drawn copper bars are wedged tightly in the rotor slots and autogenously welded to copper end end-rings, resulting in a strong rotor.

With direct-on line starting the initial torque is 1.8 times full load torque with an initial current of 4.5 times full load. For star-delta starting the respective figures are 0.7 and 1.6 times full load.

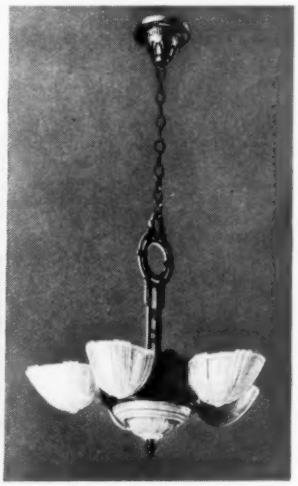
A.c. Motors for Heavy Duties

The line of steel-clad "six-ten" protected-type a.c. motors introduced by MESSRS. BRUCE PEEBLES & CO., LTD., Edinburgh, comprises a range of sizes, both squirrel-cage and slip-ring, in outputs up to 1,600 b.h.p. at 1,000 r.p.m. for the hard service conditions met with in heavy industries. These are self-contained with pedestal bearings of either the journal or ball and roller class and, it is claimed, carry the advantages of protection to vital parts, coupled with free air circulation, to larger sizes than hitherto available.

Fabricated construction has been adopted as far as possible. A full-load test applied to a typical 350 b.h.p. induction motor, in which the air-gap had been intentionally "offset" in the ratio of four to one, showed that there was no deflection.

The stator frames are built up from hexagonal heavy-steel plates consisting of two end pieces, and in the larger sizes a centre rib, held together by stiff plates located at equidistant points. These plates also serve as a seating for the core which is built from low-loss iron held between two end rings welded to the plates.

Ventilation is maintained by means of fan blades at both ends of the rotor, designed to give a direct flow of air to all parts of cores and windings. The heated air is expelled through the louvre openings which extend axially over the complete length of stator frame. All parts are flame cut to templates. The end-brackets, which are fabricated from steel plate of large section, have visible spigots on the outer periphery, thus providing for ease in erection. Holes round the end-brackets are tapped to receive the fixing bolts as jack screws, thus facilitating withdrawal of the end brackets.



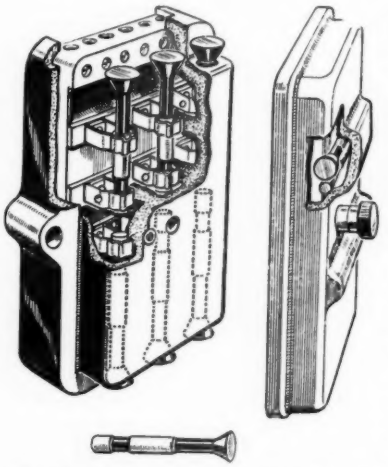
Base plates are provided on the end-brackets for the bearing pedestals which are located between vertical steel plates. Provision is made for measurement of the air-gap which can be shim-adjusted. The shafts are of large diameter made from 40-ton tensile steel. Stress concentration at the driving end is minimised by a gradual reduction in shaft diameter where it leaves the bearing.

Widely spaced terminals in a commodious eight-way terminal box permits jointing without altering the natural lay of incoming cables. Flameproof stator terminal box and flameproof slip-rings, tested and certified at Buxton by H.M. Electrical Inspector of Mines, can be fitted.

The "six-ten" machines are virtually an extension of the existing range of G and H type motors with structural modifications.

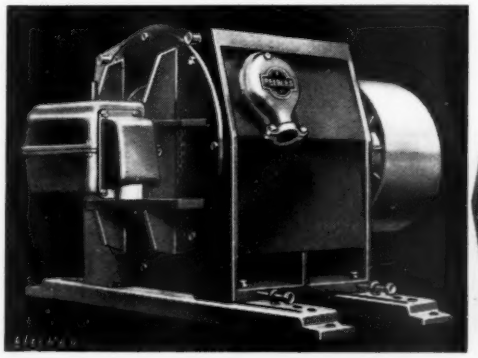
A Novel Fuse-board

THE WO-BAR MANUFACTURING CO., LTD., 69a, Shakespeare Street, Southport, in introducing its new fuse-board, has departed from orthodox design in an effort to produce a simple and safe board designed for ease and rapidity in wiring and re-fusing.

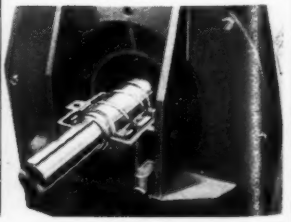


The "Wo-Bar" fuse-board showing the fuses in position, the reserve fuses in the lid, and (below) the shape of the fuse

The board comprises three parts—the base, body, and cover, all of which are robustly constructed (with adequate reinforcements) of brown bakelite. The base carries all the connection and spring clips and, with the two mains terminals and six service terminals, gives ready and rapid access to both incoming and outgoing wires. The body, when screwed into position by a central holding screw, completely covers the base and shrouds all "live" parts, making the operation of inserting and withdrawing a fuse quite safe. The fuses are inserted from each end, and contact is not made until all metal parts are inside the bakelite body; the whole assembly is enclosed by a robust bakelite cover attached by means of a captive screw. The board is supplied with six fuses fitted and on the inside of the lid are cavities in which are housed three spare cartridge fuses in 5 or 15A sizes. The connecting wires from the phosphor bronze springs and bus-bars to the terminals are moulded in the bakelite case, and the overall size is 5in. by 4in. by 2¼in., the total weight being only 1lb.



A general view of the Bruce Peebles "six-ten" motor, and (right) the arrangement of the driving and bearing bracket



Consumers' Complaints. By J. C. Woodville

Patient investigation and explanation needed

THE recommendations of the McGowan Report can be usefully considered under two headings, *viz.*, those of a speculative nature which will require considerable legislative and administrative thought and action before they can be implemented, and those which can immediately be undertaken by electricity authorities by improved methods of organisation. The Report particularly points out that authorities must maintain an adequate and efficient staff for dealing fully and promptly with complaints from consumers.

It is doubtful whether a week ever goes by even in the lives of the most efficient and conscientious authorities without a number of complaints emanating from irate consumers who feel that they have been unfairly or negligently treated. There is a type of consumer, however, who always appears to have a political axe to grind. The municipal authority is charged with incompetence on the grounds of bureaucracy and officialdom, while, on the other hand, the private company is indicted because it provides its shareholders with a dividend on their capital. Despite the personal motives, however, which are sometimes discernible in consumers' complaints, it is unwise from the supply authority's point of view to ignore or treat consumers off-handedly, as there is always some justification, however slight, for the annoyance which has roused the consumer to action.

Proper Attention

A number of complaints are received in the form of letters. In most undertakings, the chief engineer or the secretary does not have time to attend personally to the whole of the incoming correspondence each morning and the routine work of registering letters and documents is necessarily performed by other members of the staff. However, it is highly desirable that all letters of a contentious and complaining nature should be submitted to the chief engineer or secretary for his personal consideration and instructions.

If complaints are allowed to be dealt with by ordinary routine methods, weaknesses in the administrative organisation will continue indefinitely and no steps will be taken to avoid a repetition of such complaints in the future. In most commercial organisations it is a common practice for a responsible official to attend personally to all customers' complaints. As the number of consumers increases this is the only way in which an authority can satisfactorily deal with grievances.

It is generally found desirable to register all complaints in a special register so that they may be constantly reviewed and settled in the shortest possible time. Prompt investigation makes a favourable impression upon the consumer and goes a long way towards dispelling his resentment.

Delays in the delivery of electrical apparatus and the execution of wiring work are perhaps one of the main sources of annoyance to consumers. The supply authority is frequently not to blame in this connection, being dependent upon the manufacturers for the delivery of appliances, but a careful anticipation of the probable demand from consumers for various types of apparatus should enable the authority to carry a wide range of electrical products without necessarily being heavily burdened with stock. A considerable amount of trouble will be avoided if the salesmen and the showroom assistants make it their concern to know the range of electrical apparatus in stock and refrain from making promises to the consumer which cannot be fulfilled because a particular piece of apparatus has to be specially ordered.

Another likely source of numerous complaints is the thorny question of minimum charges. It is indisputable that these charges irritate many consumers. When they are insisted upon it is necessary to exercise the utmost tact and courtesy in explaining to the consumer why the charges are equitable from the supply authority's point of view. A peremptory and threatening attitude in the form of a disconnection notice will do untold harm.

Faulty Meters

A similar method of treatment is desirable when consumers complain about their quarterly accounts and maintain that the meter must be at fault. In most cases the increase in consumption over the corresponding period of the previous year is attributable to the installation of additional apparatus, especially radiators and bowl fires, which the consumer has failed to take into account. Also, sickness in a house and exceptionally dark and cold weather in the winter are other likely explanations. When these facts are pointed out to the consumer he will generally agree that his account is a reasonable one and settle it without further delay.

Another small matter which sometimes produces ill-feeling in the minds of certain consumers is the method of addressing customers. I have had personal experience of consumers demanding to know why the electricity accounts must be addressed to them as "Mr." whilst the gas company has the courtesy to use the more impressive title of "Esquire"! It is a simple matter to meet these consumers by merely altering the plates of the addressograph or making a suitable note on the account card.

Some of the complaints which have been enumerated may appear to be of a trivial nature and hardly worthy of individual consideration, but the important point to bear in mind is the cumulative effect of these small annoyances. The consumer naturally compares his electrical service with other forms of lighting and heating and it behoves all who have the interests of the electrical industry at heart to see that he receives as good, if not better, service than is given him by competitors.

The Empire Exhibition, Johannesburg

THE electrical industry will be very strongly represented at the Empire Exhibition which opens at Johannesburg next Tuesday, well over a hundred manufacturers contributing to the display. In the following list the names of standholders are given first with those of their principals in parentheses:—

African Oxygen & Acetylene (Pty.), Ltd. (British Oxygen Co., Ltd.)

Automatic Telephones (South Africa), Ltd. (International Automatic Telephone Co., Ltd.; Automatic Electric Co., Ltd.; Electric Construction Co., Ltd.)

British Elecl. & Allied Manufacturers' Association (Babcock & Wilcox, Ltd.; British Thomson-Houston Co., Ltd.; Crompton Parkinson, Ltd.; English Electric Co., Ltd.; Ferguson, Pailin, Ltd.; General Electric Co., Ltd.; Metropolitan-Vickers Elecl. Co., Ltd.; Parmiter, Hope & Sugden, Ltd.; A. Reyrolle & Co., Ltd., jointly with C. A. Parsons & Co., Ltd., and J. H. Holmes & Co., Ltd.)

British Insulated Cables (S.A.), Ltd.

Hubert Davies & Co., Ltd. (Thos. Bolton & Sons, Ltd.; Broom & Wade, Ltd.; Carron Company; Crompton Parkinson, Ltd.; Dictograph Telephones, Ltd.; Erskine, Heap & Co., Ltd.; Hart Accumulator Co., Ltd.; Igranic Electric Co., Ltd.; Herbert Morris, Ltd.; Morgan Crucible Co., Ltd.; Renold & Coventry Chain Co., Ltd.; Ruston & Hornsby, Ltd.; Stream-Line Filter Co., Ltd.; Wm. Sanders & Co. (Wednesbury), Ltd.; J. Stone & Co., Ltd.; Venner Time Switches, Ltd.; M-W. Woods, Ltd., &c.)

George Ellison (S.A.) (Pty.), Ltd.

Fraser & Chalmers (S.A.), Ltd.

Geen & Richards (Forrest Model Electric Stores; Frigidaire, Ltd.; Kelvinator, Ltd.)

Imperial Chemical Industries (S.A.), Ltd. (Lighting Trades Ltd.; Mouldrite, Ltd.; Murex, Ltd.; Murex Welding Processes, Ltd.; Steatite & Porcelain Products, Ltd., &c.)

L. Lloyd (Belling & Lee, Ltd.; Erie Resistors, Ltd.; Milnes Radio Co., Ltd.; Mullard Wireless Service Co., Ltd.; Pye Radio, Ltd.; Telegraph Condenser Co., Ltd.; Wingrove & Rogers, Ltd.)

Moreley & Co. (Empire Radio; Ilg - Kold Refrigerators; Standard Electric Stoves)

National Trading Co., Ltd. (George Bray & Co., Ltd.; International Electrolytic Plant Co., Ltd., &c.)

Samuel Osborn (S.A.), Ltd. (Birmingham Electric Furnaces, Ltd., &c.)

Rogers-Jenkins & Co. (Pty.), Ltd. (British Expanded Metal Co., Ltd.; Chance Bros. & Co., Ltd.; Crossley Bros., Ltd.; Diamond Blower Co., Ltd.; Ericsson Telephones, Ltd.; Gent & Co., Ltd., Tudor Accumulator Co., Ltd., &c.)

Skefco (S.A.) Ball Bearing Co., Ltd.

South African Cable Makers' Association (Anchor Cable Co., Ltd.; British Insulated Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; Craigpark Electric Cable Co., Ltd.; Enfield Cable Works, Ltd.; Greengate & Irwell Rubber Co.; W. T. Henley's Telegraph Works, Co., Ltd.; India Rubber, Gutta Percha, & Telegraph Works Co.; Johnson & Phillips, Ltd.; Liverpool Electric Cable Co., Ltd.; London Electric Wire Co. & Smiths, Ltd.; Macintosh Cable Co., Ltd.; Pirelli-General Cable Works, Ltd.; St. Helen's Cable & Rubber Co., Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.; Union Cable Co., Ltd.)

South African General Electric Co., Ltd. (Alfred Herbert, Ltd.; British Thomson-Houston Co., Ltd.; Canadian General Electric Co., Ltd.)

Stewarts & Lloyds, of South Africa, Ltd. (Gilbert Gilkes & Gordon, Ltd.; Glenfield & Kennedy, Ltd.; Hopkinsons, Ltd.; R. A. Lister & Co., Ltd.; National Gas & Oil Engine Co., Ltd.; Worthington-Simpson, Ltd., &c.)

Sturrock (S.A.), Ltd. (J. & E. Hall, Ltd.; Wadkin, Ltd., &c.)

Vickers & Metropolitan Carriage (S.A.), Ltd.

J. H. Vivian & Co., Ltd. (Harland Engineering Co., Ltd.; I.R.G.P. & Telegraph Works Co., Ltd.; Power Plant Co., Ltd.; Weldrics (1922), Ltd., &c.)

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

National Association of Radio Retailers

The N.E.C.T.A., Ltd., informs us that the arrangements for the National Association of Radio Retailers are practically completed, and that only registration formalities now have to be attended to. The necessary organisation for commencing the work is complete. The offices will be at 23, Bedford Square, London, W.C.1, the N.E.C.T.A. headquarters. The new association will be directed by Mr. L. C. Penwill, Companion I.E.E., and Mr. H. A. Bain will act as assistant secretary. He will join the organisation on September 21st. All N.E.C.T.A. members will shortly receive full details of the N.A.R.R. Already a number of non-members, who are engaged in the radio retail trade, have signified their desire to support the new association. Other radio retailers are invited to communicate with the secretary if they wish to receive particulars and form of application.

The World's Metal Production

The accompanying table shows the production and consumption of certain non-ferrous metals throughout the world in 1935 as compared with the previous year and the record year of 1929. The figures are in metric tons and have just been published by the Metall Gesellschaft of Frankfort-on-Main.

Works production in metric tons.

	1935.	1934.	1929.
Lead	1,368,100	1,325,800	1,739,500
Copper	1,497,500	1,280,900	1,894,800
Zinc	1,335,100	1,172,600	1,457,400
Tin	146,400	123,800	195,100
Aluminium ...	259,200	170,800	280,800

Consumption in metric tons.

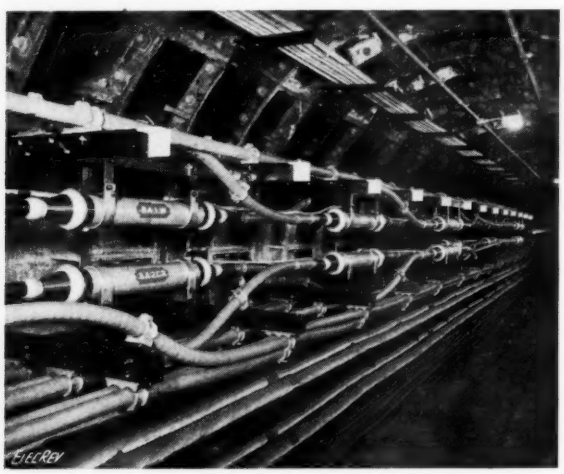
	1935.	1934.	1929.
Lead	1,450,700	1,374,800	1,702,700
Copper	1,529,500	1,275,000	1,761,400
Zinc	1,375,200	1,168,200	1,440,300
Tin	157,800	139,100	183,900
Aluminium ...	307,000	226,900	276,000

A New Cable Factory

A factory for the manufacture of fire-resisting electric cables is to be erected in Hedgeley Road, Hebburn-on-Tyne, and work has been started on the foundations. The promoters are a new concern styled Pyrotenax, Ltd., which is stated to be associated with several other large electrical companies. The new factory will be 300 ft. in length and 60 ft. wide and is to be built on a convenient site near the Newcastle-South Shields branch line of the L.N.E.R. It is understood that the building will be erected in two sections. The contractors are the Demolition and Construction Co., Ltd., London, S.W.1.

Industrial Photography

The annual exhibition of photography in commerce and industry, arranged by the Professional Photographers' Association, opened at the Royal Institute Princes Gallery, Piccadilly, W.1, on September 4th; it remains open until September 16th. Many remarkable studies of all manner of subjects



A photograph shown by Mr. G. Marshall Smith at the Exhibition of Commercial and Industrial Photography

exemplify the high level reached by good advertising. Among the more than 600 photographs are a number of exhibits of an electrical character; one of them showing cables in a subway, by Mr. G. Marshall Smith, F.R.P.S., is reproduced herewith.

International Radio Congress

The first international radio congress of representatives of the national associations for the protection of the wireless industry was held recently in Lucerne and extended over several days. In his inaugural address Herr E. Baumgartner, president of the Swiss protective union for the radio industry and trade, is reported to have stated that the object in view was the protection of native industry against the domination of the world radio trusts and patent pools. Representatives of France, Sweden, Denmark and other countries set forth the situation in their countries. The conclusion is stated to have been reached that a defensive community of all countries was necessary. The efforts were not directed against foreign competitors in the national economic life, but against the abuse of the right of hospitality by the world concerns with the object of ousting the native industry, native traders and native labour.

Further Lamp Publicity

A 10-page illustrated catalogue (List No. 36) and a folder (List No. 36a) both dealing with "Linolite" decorative architectural strip lamps and reflectors have been received from Linolite, Ltd., 96, Victoria Street, London, S.W.1. These fittings are finding increasing uses for domestic, cornice, shop-window, showcase and general lighting, and are available in a wide range of designs. The catalogue also contains particulars of "K-ray" lighting, which is specially suitable for illuminating pictures, notice boards, etc.

Pope's "Elasta" lamp window display showcard

"Elasta" coiled-coil lamps will naturally figure prominently in Messrs. Pope's Electric Lamp Co.'s lamp publicity scheme for the new season. Attractive sales aids, showcards, informative catalogues and literature are available for overprinting, and cover lamps for general, decorative, automobile, and special purposes.

Irish Free State Electrical Imports

A slightly quieter tone prevailed as regarded the imports of electrical machinery and allied material into the Irish Free State during July last, a total of £82,454 having been attained as compared with £94,914 in the corresponding month of 1935. The aggregate imports during the seven months ended with July last amounted to £539,248 as against £534,215 in the corresponding period of 1935, an increase of £5,033. The details of the imports are appended:—

	January–July. 1935. £	1936. £
Electric motors	28,651	31,630
Other electrical machinery	124,823	119,955
Dry batteries and parts	14,332	9,266
Electric lamp bulbs	41,713	33,969
Elec. lighting accessories, fittings and parts ...	47,851	49,824
Elec. wires and cables, insulated	59,164	51,936
Telegraph and telephone apparatus	3,560	5,962
Radio receivers, complete	36,924	33,705
Radio-gramophones	1,707	822
Other radio apparatus fully or partly assembled...	3,458	4,702
Radio parts and accessories	36,311	40,855
Other electrical goods and apparatus	135,721	156,616
Totals	£534,215	£539,248

As will be seen there have been various fluctuations in the trade so far this year, six of the scheduled items showing an increase and an equal number a decrease.

The Bakers' and Confectioners' Exhibition

The first "public appearance" of Lancashire Dynamo and Crypto, Ltd., as manufacturers of food preparation machinery is a feature of the Bakers' and Confectioners' and Allied Traders' Exhibition which is being held this week at the Agricultural Hall, Islington. On its large stand the company is showing no fewer than nineteen different power driven machines, including food choppers, sausage-making plant, coffee mills, vegetable peelers and washers, potato chip cutters, cake mixers and hand-driers. Several of the exhibitors are

making use of electric ovens supplied by the General Electric Co., Ltd., which, besides displaying representative models of its ovens (in particular a double-deck Peel oven of half-sack capacity per deck shown in operation), is demonstrating electric scone plates, chocolate dippers and a 20-gal. rectangular type water heater. The new "Hotric" oven manufactured by Messrs. H. Webb & Co. (Engineers), Ltd., is brick lined and has no elements exposed; it can be supplied in 1, 2, 3 or 4-tier models (5 kW each tier). An electric steam injector for bakery use is shown by Humidor, Ltd., which also specialises in oven lights. Among loaf-making equipment an entirely new single-box automatic plant shown by Messrs. Baker Perkins, Ltd., comprises a one-sack "Viennara" kneader, a water tempering and measuring tank, a one-piece divider of new design, a special "Y" type hander-up and an automatic prover discharging to a multi-spindle moulder or alternatively to a "Z" type moulder. The "Excelsior" air whip 80-qt. mixer is a new addition to the range of food preparing machinery of the C. O. Ericsson Engineering Works, Ltd., while other exhibitors of mixing, kneading, pie-making and similar equipment are Messrs. W. F. Mason, Ltd.; the Dumbrill Plant & Engineering Co.; Thomas Collins & Co., Ltd.; Herbst; the Kneeda Mfg. Co., Ltd.; the Artofex Engineering Works, Ltd.; John Hunt (Bolton), Ltd.; W. E. Burnell & Sons, Ltd.; E. F. McCourt; the New Destructor Co., Ltd.; J. Cooper-Bell Engineering Co., Ltd.; J. Crollie & Son, Ltd.; John P. Jackson & Co., Ltd.; and the Camwheat Pie Machine Co., Ltd.

The Hobart Manufacturing Co., Ltd., is making a special feature of a small mixing machine for domestic use, while Messrs. S. Guitermann & Co., Ltd., are introducing a new totally enclosed, two-speed, heavy-duty model called the "Merryway." Besides mixers and numerous similar machines, the Peerless Electrical Mfg. Co., Ltd., has among its newest products a small dish-washing machine, a self-contained bench-type potato peeler and a smaller model of its standard sausage machine. Various minor improvements have been made to the bread wrappers and slicers of Messrs. Rose Bros. (Gainsborough), Ltd., and Pelkman Bros., Ltd., and both bread and meat slicers are shown by Berkel & Parnall's Slicing Machine Mfg. Co., Ltd. Among the "Euk" Mfg. Co.'s equipment are a 1,000-piece per hour thermostatically controlled electrically operated dish washer, an automatic toaster, a doughnut machine and an automatic bread slicer with a novel interlocking device. Automatic weighing machines of a new design are to be seen on the stand of Messrs. Southall & Smith, Ltd., while the National Cash Register Co., Ltd., can supply electrically operated cash registers for all types of business. In a side hall interest is being taken in various types of electric delivery vehicles shown by Messrs. A. E. Morrison & Sons, Ltd.; Partridge Wilson & Co., Ltd.; and the Metropolitan-Vickers Electrical Co., Ltd. The exhibition closes this evening (Friday).

New Simplex Premises at Cardiff

The new Cardiff premises of the Simplex Electric Co., Ltd.

The depôt of the Simplex Electric Co., Ltd., at 4, Westgate Street, Cardiff, having become inadequate to deal with the company's increased business in its Cardiff branch area, a new branch office and stores has been established at 27-28, Hills Terrace, Cardiff. The new premises enable the company to carry more comprehensive stocks than hitherto, while there is a modern showroom in which "Creda" domestic electrical appliances and "Simplex" installation equipment are displayed.

Birmingham Trolley-buses

The Birmingham Corporation has accepted the tender of the General Electric Co., Ltd., for twelve 4-wheeler trolley-bus chassis with electrical equipment. The chassis will be built by Leyland Motors, Ltd. The electrical equipment will be of the series, field regulated type, comprising an 80-h.p. motor with the necessary control gear, collector gear, &c., for each bus; it will be manufactured at the Witton works of the G.E.C.

Rise in Australian Imports

During the trading year, ended with June last, Australian imports of electrical machinery and appliances showed an increase of over 30 per cent. in value compared with the corresponding period of 1934-35, the totals being £3,362,000 and £2,433,000. There were advances in all the leading groups (except lamps and batteries and accumulators). Especially noteworthy were the increases in imports of cables and wires, the aggregate value of which amounted to £903,700 in 1935-36, against £646,000 in 1934-35, and in dynamo-electric machines with totals of £516,000 and £285,000. Imports of telegraphic and telephonic apparatus totalled £462,600, against £218,700, and of unspecified electrical machinery and appliances £1,245,000, against £1,050,00.

Electric Drive in a Woolcombing Mill

Another example of electrical equipment superseding other forms of drive is at the Brunswick Mill of the Mossley Woolcombing Co., Ltd. The saving in space obtained by adopting electric drive is clearly indicated by the accompanying picture, which illustrates a British Thomson-Houston "no-lag" power-factor correction motor (125 h.p., 735 r.p.m., 400 V, 50 cycle,

The B.T.H. 125-h.p. "no-lag" power-factor correction motor driving mill shafting.

3-phase, 0.9 leading power factor). This motor is one of a number installed to replace the dismantled engine seen in the foreground, which previously occupied valuable space. The main low-voltage switchboard with separate wall mounting isolators comprises an incoming panel with 600-A oil-immersed circuit-breaker and instruments; two 200-A oil-immersed circuit-breakers feeding two 125-h.p. motors; two 100-A switch-fuses with ammeters, each controlling two 50-h.p. motors; two 100-A switch-fuses each controlling an 8-circuit distribution board feeding in turn small motors; and a lighting panel equipped with four 3-phase and neutral 30-A capacity switch-fuses. All the motors installed in this mill are of B.T.H. manufacture.

The G.E.C. Demonstrates Television

A number of Press representatives paid a visit to the Wembley Research Laboratories of the General Electric Co., Ltd., on Thursday of last week, and were shown what the company is doing in the field of television. They were welcomed at the laboratories by Mr. C. C. Paterson, O.B.E., the director, and Lord Hirst, the chairman of the company, spoke of the company's ability to produce the best results as a consequence of the enormous amount of research work that had been carried out in television and the production of the cathode-ray tube which was the heart of the receiver. Mr. G. C. Marris gave a brief summary of the methods employed in the G.E.C. receiver and then for half an hour the audience viewed the reception of the Alexandra Palace transmission which was on the E.M.I.-Marconi (405-line) system. The lighting and definition were excellent and there was little or no flicker. After an interval the visitors reassembled and were addressed by Mr. M. J. Railing, joint managing director of the company, who recalled his forty-five years' association with the electrical industry during which time the G.E.C. had played a leading part in communication developments. This tradition had been continued in the matter of television and the company had produced a receiver which was safe, reliable and simple to operate. He thought that television would be slower in development than sound broadcasting, but it was destined to play a great and perhaps unforeseen part in the daily life of the people in the future. Then by means of the company's own transmitter the audience was able to see the reception of a 240-line interlaced transmission for which the receiver is easily adjusted. Subsequently a tour of the laboratories was made under the guidance of members of the staff who explained very thoroughly the methods of manufacturing and testing cathode-ray tubes and other components and circuits. These tubes are now being produced in quantities at the Osram

Lamp Works, Hammersmith. One interesting feature of the tour was a demonstration of the effects of visible and ultra-violet light on the luminescent powders which are employed in the cathode-ray tubes and for colour correction in discharge-lighting units. A description of the company's receiving sets appears on page 340.

The Morecambe Open Air Swimming Pool

The Morecambe open air swimming pool which was recently opened by Sir Josiah Stamp claims to be the largest and finest of its type in the country. The pool is 396 ft. long by 110 ft. wide and the depth runs from the shallow side to 6 ft. 6 in. with a deep 15 ft. well below the high-diving structure. A feature of this pool is the design of the artificial beach with a gradual slope across the pool which makes it safe for children and non-swimmers. The lighting involved much careful planning and design. The under-water scheme by Holophane, Ltd., has fifty-five 1,000-W concentrating type submarine floodlights built flush into the wall of the north or deep water side at 6 ft. spacings and five 1,000-W concentrating units are used on the west corner where they are illuminating the deep water portion under the high-diving structure. The semi-circular portion of each end has six 500-W extensive type floodlights spaced around the semi-circle. The lighting effect by night is very attractive and, unlike the standard under-water floodlighting, the brightly illuminated deep-water portion merges into the grey shadowy slope of the bath on the artificial beach side. The construction work was carried out by direct labour under the supervision of Mr. R. B. Savage, borough surveyor. The main contractors for the work were Sir Lindsay Parkinson & Co., Ltd., Blackpool, and the electrical work was carried out by Messrs. W. J. Furse & Co., Nottingham.

Consult an optician at the first sign of eye trouble
The Sign of a Qualified and Efficient Service
But remember
that glasses are no use in the dark
USE NOT LESS THAN 100 WATTS IN A READING LAMP
100 WATT 60 WATT 40 WATT 25 WATT
Better Light—Better Sight
LIGHT AND LENSES
VISION'S PERFECT PARTNERSHIP
LOOK FOR THIS SIGN OF QUALIFIED SERVICE AND EFFICIENCY

Showcards to be used by opticians in connection with the "Better Light—Better Sight" campaign. (See page 336)

The Moffat Window Display Competition

With reference to the illustration of the presentation of the Moffat cup to Mr. R. H. Harral, the borough electrical engineer and manager at Blackburn, which appeared in our last issue (p. 314). Mr. E. S. Smith, who is on the extreme right of the group, is a director of Messrs. Moffat, Ltd., and not managing director as stated.

For Sale

Salford Corporation has five transformers for disposal. (See our classified advertisements.)

Norwegian Lamp Production

The Norsk A.S. Philips has just opened a new lamp manufacturing factory in Oslo. During a visit paid by a number of guests it was mentioned that Norway consumes about 5,500,000 lamps per annum, of which 2,500,000 are produced in the country and the remainder imported from various countries.

Trade Announcements

The London office of Messrs. H. J. Baldwin & Co., Ltd., has been transferred to High Road, Broxbourne, Herts (Telephone: Hoddesdon 678).

Tubelight Sales, Ltd., has removed to 24, Euston Buildings, George Street, Euston Road, N.W.1 (Euston 1403/4).

Electrona Electrical Products, Ltd., has removed to Eider House, Ducie Street, Piccadilly, Manchester (telephone: Central 6154).

In order to extend their sales of oil engines, lighting plant and agricultural equipment in Northern Ireland and the Irish Free State, Messrs. R. A. Lister & Co., Ltd., have opened offices and technical service depots in both Dublin and Belfast. The addresses of the offices are, respectively, 44, South Dock Street, Dublin, and 40, Victoria Square, Belfast.

Electricity in Hotels

Many electrical manufacturers are taking advantage of the opportunities for business offered by the introduction of a hotel reconstruction and modernisation section at the Wine, Spirit and Hotel Trades Exhibition now being held at Grosvenor House, Park Lane, London. One exhibit in particular, namely, a comparison of an old-fashioned and up-to-date dining room, bedroom and bathroom, provides an excellent medium for driving home the merits of electricity for domestic purposes, and among the electrical companies co-operating are Messrs. Harcourts, Ltd. (lighting fittings), Utilities (London), Ltd. (exhaust fan), Smith's English Clocks, Ltd., and Crompton Parkinson, Ltd. (lamps). These companies also have separate exhibits of their own, Utilities (London), Ltd., featuring its new "Servel" air conditioner. The exhibition has been chosen by H.M.V. Domestic Appliances, Ltd., to introduce publicly its new washing machines and ironers, as well as a 160-bottle beverage cooler, one of a new range of commercial refrigeration equipment that will soon be on the market. Examples of modern wiring contrasted with out-of-date, defective installations are given by Messrs. T. Clarke & Co., Ltd., who carried out the wiring for the exhibition and are particularly well known on account of their hotel installation work. In addition to various specimens of the usual form of neon tube signs, Ionlite, Ltd., is showing brackets for indirect illumination with tubes which give a blended colour effect. Floodlighting equipment and reflectors and accessories for interior and exterior lighting are represented by Benjamin Electric, Ltd., while other items of electrical interest are displayed by Keighley's Lifts (service lifts); C.C.A. (Vacuum Cleaners), Ltd. (cleaners and polishers); Radio Furniture and Fittings, Ltd. ("Multiline" radio receivers and public address equipment); Crittall Mfg. Co., Ltd. ("Wyndo" fan); Bakelite, Ltd.; Broadcast Distributors, Ltd. (loud-speaking telephones); Corfield-Sigg, Ltd. (aluminium ware); Warmo Heating Co. (portable electric radiators); W. T. Driver (electric trouser pressers); Tintometer, Ltd. (colour measuring and recording apparatus); and Stokes Appliances, Ltd. (table cookers and the new "Hamilton Beach" food mixer). The exhibition closes on Tuesday.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price. September 9th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/3 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£177	£5 inc.
Grade II... ... ... ,,	£125	£5 inc.
Grade III ... ... ,,	£67	£1 inc.
c Brass (rolled metal 2" to 12" basis) per lb.	7¼d.	—
c ,, Tubes (solid drawn) ... ... ,,	9¼d. to 10d.	—
c ,, Wire, basis ... ... ,,	7¼d.	—
c Copper Tubes (solid-drawn)... ... ,,	10¼d.	—
g ,, Bars (best selected)... ... per ton	£70	—
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£43 10s.	10s. inc.
d ,, ,, Wire Rods ... ,,	£49	10s. inc.
d ,, ,, H.C. Wire ... per lb.	7¾d.	¼d. inc.
f Ebonite Rod ... ... ,,	1/6 to 2/- plus	—
f ,, Sheet ... ... ,,	1/3 to 1/6 10%	—
n German Silver Wire ... ... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	10¼d.	—
i Iron, Pig (Cleveland, No. 3) ... per ton	67/6	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	—
g Lead, English Pig ... ... ,,	£20	£1 inc.
g Mercury ... ... per bot.	£12 7s. to £12 17s.	12s. inc.
e Mica (in original cases) small ... per lb.	9d. to 1/6	—
e ,, ,, ,, medium ... ,,	5/- to 10/-	—
e ,, ,, ,, large ... ,,	10/6 to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11¾d.	—
p ,, ,, rolled strip & sheet ,,	11¾d.	—
p ,, ,, wire ... ... ,,	1/0¼d.	—
o Platinum ... ... per oz.	£14	£3 10s. inc.
d Silicium Bronze Wire ... ... per lb.	8¾d.	½d. inc.
g Spelter... ... ... per ton	£13 12s. 6d.	3 s. 9d. inc.
r Steel, Magnet, in bars ... ... per lb.	7¼d.	—
g Tin, Block (English) ... ... per ton	£192	£9 inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

New Catalogues and Lists

Berry's Electric, Ltd., 85/86, Newman Street, London, W.1.—"Heating of To-Day," is the title of the company's new 44-page art catalogue of heating equipment.

Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester, 6.—A complete catalogue of radio and electrical accessories.

R. F. Winder, Ltd., Belgrave Electrical Works, Leeds.—A register of new and second-hand surplus electrical material.

British Aluminium Co., Ltd., Adelaide House, London, E.C.4.—"Aluminium Foundry Data," a new booklet.

Electro-Dynamic Construction Co., Ltd., St. Mary Cray.—Details of power equipment, convertors, &c., for radio, public address, &c.

Horstmann Gear Co., Ltd., Newbridge Works, Bath.—A catalogue of time switches.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—A 63-page radio valve guide has been issued containing also useful circuit diagrams and technical data.

James Beresford & Son, Ltd., Cato Street Works, Birmingham, 7.—Lists dealing with "Corona" hand pumps, multi-stage centrifugal pumps, &c.

Higgs Motors, Ltd., Witton, Birmingham, 6.—New illustrated lists dealing with control gear for induction motors, protected induction motors, d.c. dynamos, flange mounting motors, and fractional h.p. motors.

Brilliant Light Co., Bank Mews, Exchange Street, Romford.—A list of indoor and outdoor floodlights.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.4.—A catalogue of laboratory machinery.

Veritys, Ltd., Plume and Victoria Works, Aston, Birmingham, 6.—An 88-page catalogue of "Maxlume" lighting fittings.

Bulpitt & Sons, Ltd., Swansea Works, Birmingham, 1.—A catalogue of domestic appliances containing many new items.

James Gordon & Co., Ltd., Regent House, Kingsway, London, W.C.2.—A pamphlet dealing with "Hagan" pressure and temperature control equipment.

British Insulated Cables, Ltd., Prescot.—A leaflet describing tier type low-voltage terminal boxes for outdoor use.

Bankruptcy Proceedings

S. Allen, 43, Fossgate, York, electrical engineer.—The first meeting of creditors was held on September 4th at the Official Receiver's office, 17, High Ousegate, York. The statement of affairs disclosed ranking liabilities of £580 and estimated assets of £39, leaving a deficiency of £541. Debtor attributed his position to heavy costs of litigation and losses on contracts. The case was left in the hands of the Official Receiver as trustee.

N. A. Peters, electrical and wireless engineer, 192, Robin Hood Lane, Hall Green, Birmingham.—Trustee, Mr. R. K. Clark, 159, Great Charles Street, Birmingham, Official Receiver, released August 25th.

A. E. Douch and **M. G. Willis** (Douch & Willis), radio and electrical engineers, 109, High Street, Dover.—Supplemental dividend of 2½d. in the £, payable September 9th at 1, The Parade, Canterbury.

W. Howson (Maxivox Radio Service Co.), 7, Olton Street, Wavertree, Liverpool.—Trustee, Mr. J. Allcorn, Victoria Street, Liverpool, Official Receiver, released August 13th.

W. A. Jolly (Globe Equipment Co.), 36, Foleshill Road, Coventry.—Application for discharge to be heard on October 13th at the County Hall, Coventry.

T. Ward, radio and battery engineer, 7b, Richmond Street, Bridlington.—Application for discharge to be heard on September 29th at the Court House, Scarborough.

R. Field, electrical engineer, 61, Drewton Street, and 156, Westgate, Bradford.—First and final dividend of 1s. 7¾d. in the £, payable September 9th at 71, Manningham Lane, Bradford.

Company Liquidation

Alandale Radio & Television Co., Ltd., Woolwich, Poplar, Chatham and Bexley Heath.—Under the compulsory liquidation of this company accounts have been lodged showing total liabilities of £3,754, of which £3,136 is expected to rank for dividend, against net assets of £319, after deducting £601 for payment of preferential (£141) and debenture (£460) claims. The issued capital amounts to £1,000 and the total deficiency is estimated at £3,816. The failure of the company is mainly attributed to severe and increasing competition at all the branches, particularly at Bexley Heath and Chatham, where the disadvantageous situations of the premises aggravated the position. Excessive allowances on wireless receivers taken in part exchange and depreciation of unsold stocks were contributory causes of the failure. Mr. Charles Latham, 185-8, High Holborn, W.C., has been appointed liquidator with a committee of inspection.

Private Arrangement

S. O. Neill, trading as F. J. Jones & Son, electrical engineer, Eastgate, Chester.—The creditors herein met recently at Chester, when the representative of Messrs. T. Beadle & Co., Ltd., the principal trade creditors, was elected to the chair. The statement of affairs showed ranking liabilities of £7,284. The net assets were £1,302, leaving a deficiency of £5,982. It was reported that the debtor purchased the business in February, 1934, at a cost of £2,500. At that time his capital was approximately £500 and he obtained a loan from a relative. The business had a good connection, and during the year to February, 1935, the turnover was £10,235, but after allowing for all the expenses there was a net loss of £560. No detailed accounts had been prepared since that date, but it was estimated that the turnover had increased during the year to February, 1936, to approximately £12,000. A resolution was passed confirming the deed of assignment already executed to Mr. J. Dodd, accountant, Chester, with a committee of the principal creditors.

Dissolution of Partnership

Henry Arnold, radio and electrical engineers, 206, Kingston Road, Teddington.—Messrs. A. Janzen and H. W. Cook have dissolved partnership. Mr. Cook will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Abingdon.—OVERHEAD LINES.—The Rural District Council has consented to the erection of overhead lines by the Abingdon Electric Supply Co., on the Elms Park estate, and has requested the company to extend its mains in order to supply houses at Gossard's Ford.

Australia.—£120,000 SCHEME.—The Sydney County Council is considering a programme of work for the improvement of voltage regulation at the extreme ends of its distribution network. It is proposed that additional distributing centres shall be installed, conductor sections increased, and additional conductors erected. The cost of the work, which is to be spread over a considerable period, is estimated at £120,000.—*Electrical Engineer and Merchandiser.*

EXTENSIONS AT PORT KEMBLA.—Our contemporary also reports that the New South Wales Government has decided to spend £55,000 on the extension of its steam power station at Port Kembla. It is hoped that Australian Iron and Steel, Ltd., will purchase energy from the station for use in the new works which it proposes to erect.

Birkenhead.—ASSISTED WIRING.—The Electricity Committee proposes to apply for sanction to borrow £10,000 for its assisted wiring scheme.

Blackburn.—ELECTRICITY IN GAS MASK MANUFACTURE.—The Electricity Committee has approved an application for the supply of electricity to Garden Street Mill, which has recently been taken over and reconstructed by the Government for the manufacture of gas masks.

Bolton.—ELECTRICITY'S THREAT TO GAS.—Within recent years there has been an increasing tendency to change over from gas to electricity in many Lancashire towns for the illumination of main roads, sodium vapour electric discharge lamps being favoured. Councillor Jones pointed out to the Bolton Town Council recently that the question was a serious one to the Gas Department. The Gas Committee contemplated the elimination of meter rents, but if the policy of using electricity for street lighting were continued it was possible that the Gas Department would require support from the rates. In reply, Alderman Demaine said that the Lighting Committee had tried gas for a long time. It was satisfied that for outer roads sodium lighting was best. However, it was not bigoted about either gas or electricity. Gas was still being installed in many new streets.

MAINS.—For the extensions of mains, sanction to borrow £50,000 has been received by the Electricity Committee.

Bristol.—METERS.—The Electricity Committee is seeking sanction to borrow £50,000 for meters.

Canterbury.—HEATING OF SCHOOLS AND CHURCHES.—Approval has been given to a proposal of the Electricity Committee to introduce a sliding scale of from ¾d. to $\frac{9}{16}$d. per kWh for the heating of schools and churches.

Carlisle.—MAINS EXTENSIONS.—The Electricity Committee is to extend its mains at a cost of £7,800.

Cheltenham.—LOANS.—Sanction has been obtained to loans of £527 for overhead mains to Whaddon Farm Estate, £1,958 for mains for Seven Springs and Coberley and £298 for plant.

Darlington.—FORGE SUPPLY.—An interview is being arranged between the Council and the English Steel Corporation in regard to the Electricity Department supplying electricity to the company's forge.

Daventry.—RURAL SUPPLIES.—The Rural District Council has decided to approach the Ministry with reference to a supply of electricity to Weedon.

Dewsbury.—CHANGE-OVER.—Application has been made by the Council for sanction to borrow £10,000 for mains and services in connection with the change-over.

Eastbourne.—TARIFF INCREASES.—The borough treasurer has submitted a special report on the accounts for the year which closed with a net loss of £624. The Electricity Committee considers that to safeguard the financial position of the undertaking and to avoid so far as can be foreseen any danger of a loss on the revenue account, £12,000 per annum must be found in addition to the normal expansion of revenue consequent on the development of the undertaking. It is, therefore, proposed to increase the charges for electricity as follows: Domestic all-in tariff for the borough to be raised from 7½ per cent. to 10 per cent. on rateable value, and the minimum payment from £2 per annum to £2 10s. Lighting flat rate to be increased from 3¼d. per kWh for the first 2,500 kWh per quarter to 3¾d. for the first 5,000 kWh per annum, and from 3½d. to 3¼d. per kWh for the second 5,000 kWh per quarter. In the rural area the increases are: Lighting flat rate, from 6d. to 6¾d. per kWh; power, from 1¾d. to 2d. per kWh for the first 250 kWh during the winter quarters and 1¾d. beyond, and 1¾d. for the first 250 kWh in the summer quarter and 1¼d. beyond. Heating and cooking, an increase of ¼d. per kWh for the winter quarters. Free wiring, except for new houses is to be discontinued, and there are other savings in regard to consumers' appliances. The estimated total additional revenue and savings per annum is £12,464.

Eccles.—STREET LIGHTING.—Sanction has been obtained to a loan of £1,604 in connection with the installation of "Osira" street lighting in Regent Street, Church Street, Lane End and Gilda Brook Road.

France.—ALSACE-LORRAINE.—ELECTRICITY OUTPUT.—According to a return lately issued by the Groupement des Producteurs et Distributeurs d'Énergie Electrique d'Alsace et de Lorraine, the output of power by the undertakings in the two departments belonging to the group amounted during last year to 519 million kWh as compared with 553 million kWh in 1934, a decline of about 6 per cent. In addition, a large quantity of power was taken from outside areas, the total sales during the twelve months amounting to about 819 million kWh against 853 million kWh during the preceding year, a drop of 4 per cent. The decline is attributed to the depressed state which existed in the manufacturing industries. Special efforts are to be made to popularise the use of domestic electrical appliances.

Godstone.—SUPPLY TO COPTHORNE.—The Horley and District Electricity Supply Co., Ltd., has applied to the Rural District Council for permission to construct overhead lines at Copthorne.

Hove.—LOWER CHARGES.—The following reductions in charges have been made by the Electricity Committee: Power, heating and cooking, from 1d. to ¾d. per kWh in the winter, making the flat rate ¾d. per kWh all the year round; domestic all-in tariff, fixed quarterly charges lowered by approximately 15 per cent.; business all-in tariff, reduction of 15 per cent.; hire charges, lowered by 25 per cent.

Longhope.—SUPPLY SCHEME.—The West Gloucestershire Power Co. is to prepare a detailed scheme for providing a supply of electricity in the area.

Midlands.—LOWER CHARGES.—The Midland Electric Corporation for Power Distribution, Ltd., announces a further reduction of 2½ per cent. in charges in the standard tariff, to operate on all accounts rendered after January 1st last.

Motherwell.—MAINS EXTENSIONS.—The Corporation has decided to extend its mains to supply houses on the Meadowhead site, at an estimated cost of £4,383.

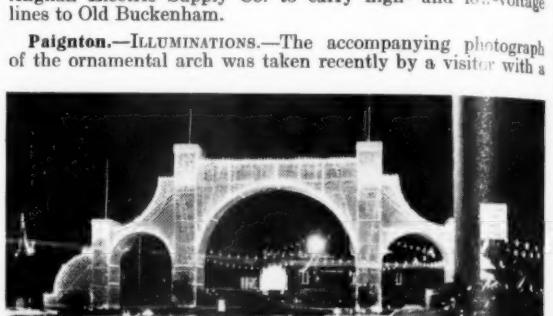
New Zealand.—PROPOSED ELECTRICITY SUPPLY INVESTIGATION.—The Minister of Public Works (the Hon. R. Semple) is to investigate the electricity supply administration. The Minister is reported by the *New Zealand Electrical Journal* to have stated recently that this was another service calling for reform and fairly drastic reform at that. It was both cumbersome and costly, and all over the country there were quarrels among local supply authorities, power boards, and the Government. He was satisfied that there were too many power boards with too little to do and operating at too great a cost.

SELLING COOKERS.—To help the domestic load, a special cooker sales campaign was instituted at Christchurch towards the end of 1934. The plan was to spend one year's average revenue of a cooker in permanently securing such revenue by the sale of the cooker, the money to be applied to meeting the cost of providing a 20 per cent. discount on the retail price of the cooker, of including the wiring in the reduced price, and of giving five years' terms without interest. By the end of March last 2,069 cookers had been sold under these concessions, and the cost worked out at £4 7s. 6d. per cooker. Mr. E. Hitchcock, the general manager of the undertaking, feels that this result bears out the claim that assistance in the purchase of appliances has become the greatest need of the consumer, the cost of electricity being already low.

COBB RIVER DEVELOPMENT.—The Minister for Public Works has conditionally agreed to allow the Hume Pipe Co. to assign its licence to develop hydro-electric power on the Cobb River, Takaka, for the Nelson district, to a subsidiary company. The Hume Pipe Co. proposes to proceed first with the installation of a standby plant and to supply electricity for district requirements. The capital of the proposed company is to be £550,000.

Old Buckenham (Norfolk).—SUPPLY PROMISED.—It is announced that the village will have a supply of electricity by the end of the year, as also will Garboldisham. The Wayland Rural District Council has granted permission to the East Anglian Electric Supply Co. to carry high- and low-voltage lines to Old Buckenham.

Paignton.—ILLUMINATIONS.—The accompanying photograph of the ornamental arch was taken recently by a visitor with a small box camera. The arch is illuminated by 800 15-W internally colour-sprayed "Osram" lamps.



The ornamental arch at Paignton is an effective decoration

Serbia.—NEW POWER STATION.—Newspaper reports mention that an up-to-date hydro-electric power station is soon to be constructed near Orhid, on the River Letnica, states *Reuter's Trade Service* from Belgrade.

Stockport.—ELECTRICITY AND GAS CO-ORDINATION REJECTED.—A proposal for co-ordinating the activities of the gas and electricity undertakings has been rejected by the Town Council, on the grounds that it would lower their efficiency.

Spalding.—PREPARING FOR THE CORONATION.—The Council has decided that a minimum of £500 shall be earmarked for the Coronation celebrations in the town. In addition, the Electricity and Gas Departments are to be asked to provide £100 each. It was stated that the Jubilee arrangements did not do the town credit, and that on this occasion they should endeavour to do better.

Tadcaster.—SUPPLY AT SOUTH MILFORD.—The Rural District Council has decided to raise no objection to the Electrical Distribution of Yorkshire, Ltd., erecting overhead mains to supply the Council's housing estate at South Milford.

Torquay.—ACQUISITION OF PAIGNTON UNDERTAKING.—Representatives of the Paignton Urban District Council have met the Torquay Corporation Electricity Sub-Committee with reference to the U.D.C. acquiring the electricity undertaking and transferring it to the Corporation. The Torquay Committee is to negotiate with the Supply Co. in order to ascertain whether an agreement can be arrived at for the acquisition of the Paignton undertaking by the Corporation.

The pirate ship (left) and "Sloppydorus," two items in the illuminations at Southend-on-Sea

Turkey.—ELECTRIC POWER DEVELOPMENT.—In connection with the industrial development of Turkey, the Government has recently set up what is known as a "Research Service for Electrical Affairs" to discover where large electric power generating stations will be necessary. The service has commenced its inquiries in the Ankara, Zongouldak, Kutahia, Adana, and Egee areas, the results of which will also assist in the problem of deciding which stations shall be thermal and which hydro-electric. It has been practically decided to erect a large thermal station in the Zongouldak district near to the Heraclea collieries.

Traction

Brazil.—UNDERGROUND PROJECT.—According to the *Railway Gazette*, an invitation for tenders for the construction of an underground railway in Rio de Janeiro met with no response. The city authorities are, therefore, considering the offer of a group of American financiers to advance a sum equivalent to £10,000,000, subject to satisfactory guarantees. The proposed routes of the original scheme were from Morro do Castello, in the centre of the city, to the residential suburbs of Cascadura and Copacabana.

RIO SUBURBAN LINE.—The first section of the £3,000,000 electrification of the Central Railway now being carried out by the Met.-Vick Co. is due to be opened in January next. It will extend from the Dom Pedro terminus in Rio to Engenho de Dentro, a distance of 7¼ miles.

Burma.—TROLLEY-BUSES FOR RANGOON.—An electric trolley-bus service has been inaugurated in Rangoon. Double overhead wires for the new buses have been installed in a number of thoroughfares, including the main street of the city. The opening ceremony was performed by the Mayor. Later, the Governor of Burma, Sir Archibald Cochrane, inspected the trolley-bus depots.—*Reuter.*

India.—BORIVILI-VIRAR ELECTRIFICATION COMPLETED.—The extension of the Bombay, Baroda and Central India Railway electrification between Borivili and Virar, which was sanctioned in June last year and on which work was begun in December, has now been completed. The capital expenditure on this section amounts to over two million rupees and covers the provision of the necessary track equipment and bonding of the running rails of the sixteen miles of double line between Borivili and Virar, and the provision of the new sub-station at Bassein Road. The Tata Company provides a 22,000-V a.c. supply by duplicate lines. The use of glass-bulb mercury arc rectifiers is a new departure for heavy railway electrification in India and the equipment embodies the latest principles of voltage control. The electrification of the section will provide an accelerated service to outlying districts and will also effect a considerable saving in time on the journey to and from Bombay. Sir Guthrie Russell, Chief Commissioner of Railways in India, inaugurated the new service by first connecting the 22,000-V supply to the bus-bars and then operating the necessary switches to enable electric power to be supplied to the track equipment. A special electric train took a party to see the electrical equipment under working conditions.

Ipswich.—TRANSPORT RETURNS.—A favourable situation is indicated by the annual report of the chief engineer and manager of the Transport Department, Mr. H. E. Blackiston. Making allowance for the Royal Show, the income was £3,520 better than in the previous year. Expenditure increased by 4¼ per cent., due primarily to better services and increased wages. Passenger journeys increased by 345,000. The trolley-buses made a net surplus of £3,374, which was, however, counterbalanced by a deficit of £3,247 on the tramways.

Liverpool.—MODERN LIFTS.—Four high-speed electric lifts are being installed at the St. James' Street Station. Each will accommodate 60 people and will be able to travel at 400 ft. per minute. There will be loudspeakers warning passengers to "stand clear of the gates."

Manchester.—STEAM V. ELECTRICITY.—Speaking at a meeting in Manchester recently, Dr. C. H. Higgs, of the Metropolitan-Vickers Electrical Co., Ltd., said that the speed attained by main-line steam trains was just about as great as the tracks would stand. The chief advantage of electrification was the considerable reduction in working costs which it made possible. Railway travel under electrified conditions was, of course, a good deal cleaner. With regard to suburban lines, it was becoming more and more necessary to increase the number of trains by accelerating existing services. This could be accomplished more easily with electric than with steam trains.

Newcastle.—TROLLEY-BUSES.—In view of the expense of relaying tram track, the Transport Committee has recommended that the trolley-bus system shall be extended at a cost of between £70,000 and £75,000.

South Africa.—MAIN LINE OPENING.—The 54-mile double-track main line between Cato Ridge and Durban will be opened before the end of this year, and through trains drawn by electric locomotives will then run all the way from the Natal coast to Harrismith, in the Orange Free State, a distance of 255 miles. Test runs have been made in order to prove the efficacy of the current collection and the operation of the grid-controlled rectifiers in both d.c.-a.c. and a.c.-d.c. directions, as the locomotives are fitted with regenerative braking.

Sweden.—ANOTHER ELECTRIC RAILWAY.—On October 1st the west coast line of the Swedish State Railways extending from Gothenburg to Malmö (185 miles) will be opened throughout to electric traction on the single-phase system. A short mileage at the Malmö end has been operated electrically for some months.

Switzerland.—MOUNTAIN LIFT.—The electric lift to the summit of the Burgenstock on Lake Lucerne, originally built in 1905, has been reconstructed and enlarged. In its latest form the lift is claimed to be not only the highest but also the most rapid in the world, passengers being raised to a height of about 542 ft. in 62 seconds.

Communications

Austria.—RADIO-TELEGRAPHY.—A direct radio-telegraph service has lately been inaugurated between Austria and Riga, Latvia.

France.—TELEVISION FEATURES AT EXHIBITION.—Reporting on the Radio Exhibition which opened last week at the Grand Palais, Paris, *The Times* states that television is undoubtedly the main feature. Among the receivers priced, the range seems to be from 4,500fr. to 10,000fr. Both the tele-cinema apparatus are working with 240 lines and 25 pictures a second. M. Barthelemy, the French television expert, is making use of a camera that needs only one-fifth of the light required by the cameras now in use for the Eiffel Tower transmissions. When the exhibition is finished, the cameras will be used for the State television transmissions.

Great Britain.—TELEVISION RECEPTION.—Although the expected service range of the Alexandra Palace television station was estimated at 25 miles, reports have reached the B.B.C. of satisfactory reception at Birmingham, Bournemouth and Nottingham, states the *Daily Telegraph.*

Irish Free State.—TELEPHONE IMPROVEMENTS.—Since the reduced scale of charges came into operation there has been an appreciable increase in telephone calls, particularly in the number of trunk calls. The Ministry for Posts and Telegraphs has a big programme in hand for the improvement of the service generally all over the country. Special attention is being paid to the development of trunk lines.

Italy.—TELEVISION STATION.—It is reported by *Reuter* from the Vatican that the Pope intends to install a television station in the Vatican under the advice of the Marchese Marconi.

Japan.—RADIO-TELEGRAPHY.—A direct radio-telegraph service has recently been inaugurated between Tokio, Japan, and Tientsin, China.

PROPOSED RADIO RELAYS.—The *Far Eastern Review* reports that the Nippon Broadcasting Association has introduced a joint radio receiving system for farming and fishing districts which will allow from 10 to 50 subscribers to connect their speakers to a central receiving apparatus furnished and maintained by the Association.

London.—TELEPHONE BREAKDOWN.—A breakdown at the Central Exchange, London, early last Friday put 18,000 telephones out of action for about twenty minutes.

New Zealand.—RADIO BEACONS.—It is reported in the *New Zealand Electrical Journal* that radio beacons are to be erected at Baring Head and Cape Campbell.

Tarraleah (Tasmania) and its Significance

EARLY next year the first unit of the Tarraleah development, giving an additional 21,000 h.p., is expected to be placed in service by the Hydro-electric Commission of Tasmania. From the report of the Commission for 1934-35 that has just reached us it appears that almost all of the State's available power was retailed to customers so that, with the big revival in mining activities and the prospect of the paper and pulp industry commencing in the near future, the Tarraleah project has become a pressing necessity. Gradually the network of power lines is extending throughout the State. The south, north, and north-west areas have been linked for some years and now the west coast and the north-east areas are being included. When the Tarraleah development is completed it is believed that a new era of prosperity will open for Tasmania.

The present development is designed to produce an additional 63,000 h.p., with an ultimate installed capacity of 126,000 h.p. Details of the scheme were given in our issue of June 5th, page 831. Briefly, the water will be drawn from Lake St. Clair, on the River Derwent, which is being diverted about 16 miles below the lake. The water will be conveyed to the Tarraleah power station by a canal about 13 miles long, and dropped by steel pipe lines to the generating plant 1,000 ft. below, on the River Nive, whence it will return to the River Derwent. In this way it will be possible to make use of the water for future schemes down stream. The estimated cost of the first section of the Tarraleah development is £1,200,000.

For the power requirements of the construction work a 21-mile transmission line was constructed across elevated country. An unusual feature was the crossing of the Nive gorge in a single span of 4,300 ft.; the conductors, each supported on separate wooden poles, consist of stranded "Copperweld" 37/0.091 with 60 per cent. high tensile steel core in each strand.

With the largely increased demand for power, satisfaction is felt at the way in which the Waddamana power station is meeting the call made upon it. The maximum daily load factor during 1934-35 reached 97.9 per cent. and the average for the year was 81.48 per cent. The output of the Waddamana, Shannon and Devonport stations was 385 million kWh (38 million kWh increase on the previous year), of which 364 million kWh was generated at Waddamana, whose peak load was 51,000 kWh.

On March 1st, 1935, an interruption of six minutes occurred at Waddamana, due to the failure of a current transformer, smoke from burning insulation making it difficult for the correct isolating links to be opened until the atmosphere had cleared sufficiently. This was the first total interruption at the station since 1930, a record of which the operating branch was justifiably proud.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Atcham (SALOP).—September 22nd. R.D.C. Electrically (alternatively, oil engine) driven borehole pumping plant in duplicate. Willcox, Raikes & Marshall, 33, Great Charles Street, Birmingham (£2 2s.).

Australia.—TOWNSVILLE.—December 17th. City Council. One 2,500-kW geared turbo-alternator. (T.Y. 30758.)*

Barking.—September 18th. Borough Council. Electrical installation work in flats and houses to be erected in Upney Lane, Blake Avenue, Tanner Square, Red Lion Place and Ripple Road. (September 4th.)

Beckenham.—September 28th. Borough Council. Four three-phase transformers. (September 4th.)

Birmingham.—September 23rd. Electric Supply Committee. Transformers and e.h.v. switchgear. (September 4th.)

Brackley.—September 21st. Corporation. Electrically driven, automatically operated centrifugal pumping plant (in duplicate) and two rotary sewage distributors. Howard Humphreys & Sons, 17, Victoria Street, London, S.W.1 (deposit £2 2s.).

Bradford.—September 23rd. Corporation. Fire extinguishing installation at the Valley Road power station. (September 4th.)

Cardiff.—September 14th. Electricity Department. Lamps. (September 4th.)

Darlington.—September 15th. Corporation. Trolley vehicles. (August 28th.)

Dumfries.—September 21st. County Council. Electrical work at twenty-six houses at Marchmount. J. Robson, County clerk, County Buildings.

Egypt.—CAIRO.—November 17th. Ministry of Public Works. Equipment for Gebel Aulia colony, Sudan, comprising electrical distribution network, power house (Diesel), workshop, filter plant, ice plant and pumping sets. Chief inspecting engineer, Egyptian Government, 41, Tothill Street, London, S.W.1 (deposit £2 1s., not returnable).

Exminster.—September 25th. Committee of the Devon Mental Hospital. Electrical goods, &c., for six months from October 6th, next. C. Masters, clerk.

Great Western Railway.—September 24th. Telegraph instruments, electrical apparatus, &c. (See this issue.)

Hastings.—Borough Council. Electric lighting at ninety-five houses on the Hollington site, No. 3A. S. Little, borough engineer, 37, Wellington Square, by September 14th.

Huddersfield.—September 21st. Borough Council. Bodies and chassis for trolley-buses and overhead material and poles. General manager and engineer, Passenger Transport Department, John William Street (deposit £2 2s.).

India.—SIMLA.—October 27th. Stores Department (Electrical Branch). House service d.c. and a.c. meters. (T. 30724.)*
NEW DELHI.—September 29th. Stores Department. Rotary convertors, transformers and switchgear. (T.Y. 30704.)*
December 3rd. A.c., 220/230-V sweep ceiling fans. (T. 30736.)*
December 10th. D.c. 220/230-V sweep ceiling fans. (T. 30735.)*
January 7th, 1937. 220/230-V a.c. and d.c. table fans. (T.Y. 30741.)*

Irish Free State.—DUBLIN.—September 18th. Commissioners of Public Works. Electrical works and supplies for one year from October 27th next. T. Cassedy, Office of Public Works (deposit £1).

Kirkcaldy.—September 14th. Corporation. Electrical work at the Loanhead housing estate. Borough surveyor.

Littleborough.—September 24th. U.D.C. Electricity Department. E.h.v. overhead transmission line and underground cables and sub-station equipment, comprising one e.h.v. and one l.v. switch unit and one combined neutral and l.v. metering panel. (See this issue.)

London.—HACKNEY.—September 23rd. Electrical installation at a block of flats. (August 28th.)

Lowestoft.—September 12th. Committee of the Lowestoft and North Suffolk Hospital. Electric lamps, repairs and renewals for one year. W. J. Stephenson, secretary.

Luton.—September 19th. Wiring and installation of electric lighting and fittings in 184 houses. J. W. Tomlinson, borough engineer, 12, Upper George Street.

Mablethorpe.—September 19th. U.D.C. Four sets of pumping machinery for unscreened sewage, including electric motors. Silcock & Simpson, 25, Victoria Street, London, S.W.1 (deposit £5).

Manchester.—September 21st. Electricity Committee. Motor driven boiler feed pump, flue gas ducts, dismantling existing gas ducts and modifications to pipework, h.p. steam and feed water pipework and l.p. circulating water pipework, and one 2,000-kVA transformer for the Barton power station, and one 10,000-kVA transformer for the Dickinson Street station. (September 4th.)
September 23rd. Three-phase, 6,600-V, sheet-steel, cubicle-type switchgear. (See this issue.)

Middleton (LANCS).—September 12th. Borough Council. Static transformers. Borough electrical engineer, Corporation Street.

Musselburgh.—September 21st. Town Council. Electrical work at twenty-four houses. Borough surveyor.

Newcastle-upon-Tyne.—City Council. Electric lighting in 339 houses. R. G. Roberts, city architect, 18, Cloth Market.

New Zealand.—WELLINGTON.—October 20th. Public Works Department. Electric motor-driven pump. (T.Y. 30688.)*
October 13th. Two oil circuit-breakers. (T.Y. 30693.)*
October 27th. Three 66-kV potential transformers. (T.Y. 30690.)* Four 66-kV oil-immersed circuit-breakers. (T.Y. 30697.)* Two 5-ton and one 2-ton electric cranes. (T.Y. 30695.)*
November 3rd. One set of 11,000-V indoor metal-clad switchgear. (T.Y. 30742.)* Two 100-kVA transformers. (T.Y. 30743.)*
AUCKLAND.—October 6th. Public Works Department. Two outdoor-type, 110,000-V, 400-A, 3-phase oil-immersed circuit-breakers. (T. 30696.)*

Rotherham.—September 15th. Electric lamps for six months. Public assistance officer, Municipal Offices.

Salford.—September 24th. City Council. 6,600-V, three-phase, oil-immersed power transformers. (See this issue.)

Sheffield.—September 21st. Electricity Committee. Meter testing equipment. (See this issue.)
September 28th. Two 15,000-kVA transformers with on-load tap-changing gear. (See this issue.)

Sleaford.—September 21st. U.D.C. Electricity Department. L.v. underground distribution mains and material and service cut-outs, joint boxes, insulating tape, meter boards and joint box compound. (September 4th.)

South Shields.—Town Council. Electrical installations in 468 houses to be erected by the North Eastern Housing Association, Newcastle-upon-Tyne. J. Reid, borough engineer, Town Hall.

Uruguay.—MONTEVIDEO.—October 28th. State Electricity Supply and Telephones Administration. Electricity meters. (T.Y. 30760.)*

Walsall.—September 15th. Walsall and West Bromwich (Barr Colony) Joint Board. Engineer's and electrical fittings for six months commencing October 1st next. Clerk and steward, Great Barr Park Colony.

Wakefield.—September 26th. R.D.C. Electrical wiring, &c., in 142 houses. W. E. Massie, Council's engineer and surveyor, Council Offices, 18, St. John's North.

West Midlands.—September 22nd. Joint Electricity Authority. (*a*) 33-kV transmission switchgear and step-down transformers; and (*b*) 11-kV distribution switchgear. (August 28th.)

Weymouth and Melcombe Regis.—September 29th. Borough Council. 11,000-V overhead and underground lines and l.p. overhead lines. (See this issue.)

* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Birkenhead.—Watch Committee. Accepted. Rewiring at Sessions Courts (£355).—S. George.

Blackburn.—Town Council. Accepted. Internal telephone system at the Queen's Park Hospital.—Standard Telephones.

Carlisle.—Housing Committee. Accepted. Wiring 456 houses on the Council estate (£1,947).—Ellison Bros.

Dundee.—Harbour Board Works Committee. Accepted. Electric lighting at Harbour extensions (£198).—Stenson & Co.

Fife.—County Council. Accepted. Electrical work at 28 houses at Kelty.—T. S. Miller, Dunfermline.

Glasgow.—Cleansing Committee. Accepted. Twenty electric vehicle batteries (after allowance for old batteries), (£4,942).—Tudor Accumulator Co. Plant for the extraction of fine dust from refuse (£2,520).—International Combustion, Ltd.
Education Committee. Accepted. Electrical work at schools: East Keppoch temporary R.C. (£774).—W. S. Watson, Ltd.; Knightswood temporary (£222) and Allan Glen's (£144).—Kennedy, Stark & Co.; Stow College school of Building and Allied Trades (£117).—T. B. and J. A. Mathieson, Ltd.
Housing Committee. Accepted. Electrical installation at 30 houses on the Provanmill estate (£1,288).—W. S. Watson, Ltd.
Public Assistance Committee. Accepted. Cinema equipment at Lennox Castle Institution (£1,244).—Western Electric Co.

Newcastle-on-Tyne.—City Council. Accepted. Electrical refrigeration plant at the Elswick Grange Hospital (£311).—H. C. Troldahl. 200-kVA transformer for the Manors power station (£140).—C. A. Parsons & Co.

New Zealand.—DUNEDIN.—City Council. Three-phase transformers (£325).—British General Electric Co. Overhead travelling crane for 30,000-V sub-station (£625).—Grieve & Co. Synchronous condenser (£8,201).—Met.-Vick. Electl. Co.—*Tenders.*

Scarborough.—Electricity Committee. Accepted. Switchgear modifications at six sub-stations (£1,073).—Met.-Vick. Electl. Co.

Wakefield.—Housing Committee. Accepted. Wiring ninety-two houses on the Lupset estate.—G. Ashton.

Forthcoming Events

Institute of Metals.—Monday, September 14th, to Friday, September 18th. Paris. Annual autumn meeting.

Institution of Engineers and Shipbuilders in Scotland.—Monday, September 14th, to Saturday, September 19th. New York. International meeting of naval architects and marine engineers.

Building Exhibition.—Wednesday, September 16th, to Wednesday, September 30th. Olympia, London, W.14.

Notes

All-electric Houses in the Free State

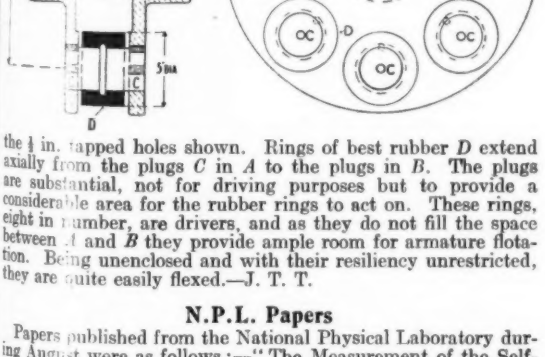
Electricity is playing an increasingly important part in the many housing schemes at present in progress in the Irish Free State. Owing to the lower rates for electricity in the city the majority of these all-electric houses were built in or around Dublin, but now that the reduced charges for electricity have come into operation all over the country, the number is likely to be considerably increased. In a scheme of forty-six houses at Drumcondra, Dublin, selling at £720 each, the builders decided to build only electric houses (one coal-electric fire in each) and these were all sold before very many of them had been completed. In a south city suburban area two hundred houses, selling at £795 each, are in course of erection. The standard house has only one flue, and electric fires are installed in the bedrooms. The builder provides all-electric houses for an additional £5, and these contain electrical equipment to the value of £30; this is possible on account of the saving effected by doing away with unnecessary chimneys, hearths, &c. The latest addition to these schemes is one of 100 houses selling at £715. Sixteen houses are nearly finished and seven of them are completely electric—the builders having such confidence in the electric house that they have not installed a single coal fire. Others houses, ranging in selling price up to £2,000, have been constructed on similar lines, showing that the economy and efficiency of the all-electric homes are being rapidly appreciated by families representative of all classes and means. Builders are co-operating in supplying facilities for this up-to-date type of house, which they find is fast becoming a "best seller." Owners of property are considering the question of converting old houses to electricity, and one such completed project is on view at Monkstown, County Dublin. The lead given in Dublin has already been followed in Limerick, Waterford and Cork.

British Foundry School

The first annual report of the British Foundry School shows that, with one exception, all the thirteen students enrolled for the first session were nominated by their employers and have been maintained by them (£120 minimum). The average age of the students was about 25 years. The course, which is an arduous one and requires the students' full attention, covers about forty weeks. Contributors toward the cost of the school included several electrical and allied firms. The next session commences on September 31st at the Central Technical College, Birmingham.

Flexible Couplings

The function of a flexible coupling between the machines comprising a motor-generator is to provide for the two units coming out of alignment (due, for example, to subsidence of foundations) and also for axial flotation of the shafts. My experience is that the reeved belt type of coupling does not make effective provision for end flotation and that the thin rubber sleeves, in metal surroundings, in one half of a bolted coupling may quickly disintegrate. In order to overcome these and similar difficulties with a 100-h.p., 500-r.p.m. motor generator, I designed the coupling illustrated. *A* and *B* are similar steel members attached to the shafts—a good sliding fit—with a feather and a pair of "Allen" set screws (this for easy installation). The eight plugs *C* are a light driving fit in *A* and *B*, driven in from the outside and easily withdrawn by means of



the ¼ in. tapped holes shown. Rings of best rubber *D* extend axially from the plugs *C* in *A* to the plugs in *B*. The plugs are substantial, not for driving purposes but to provide a considerable area for the rubber rings to act on. These rings, eight in number, are drivers, and as they do not fill the space between *A* and *B* they provide ample room for armature flotation. Being unenclosed and with their resiliency unrestricted, they are quite easily flexed.—J. T. T.

N.P.L. Papers

Papers published from the National Physical Laboratory during August were as follows:—"The Measurement of the Self-inductance of Variable Condensers," W. H. Ward (*Journal of Scientific Instruments*); "Some Recent Researches into Fatigue of Metals," H. J. Gough (*Teknisk Tidskrift Mekanik*); and "The Strength of Metals in the Light of Modern Physics," H. J. Gough and W. A. Wood (*Journal* of the Royal Aeronautical Society). The N.P.L. is not able to supply copies of such papers; these are to be found in technical journals or in the proceedings of scientific societies.

E.A.W. Activities

The Electrical Association for Women has now sent us further details of its Home Workers' Certificate. Meetings are to be held throughout the country, if possible, at the local electricity showrooms. It is hoped that engineers will give every facility for the necessary training for the certificate. Details of the examination have already been fixed, and the campaign has been promised the support of E.D.A. and of many engineers. In connection with the campaign the Dowager Lady Swaythling has offered a prize of £3 3s. for the best alternative to the title "domestic servant."

Applications for this year's Summer School of Electrical Housecraft, which is to be held at King's College of Household and Social Science (University of London), Campden Hill Road, London, from September 24th to 29th, have been so numerous that 85 out of 189 have had to be refused. On the first evening there will be an informal reception by Miss Reynard, warden of the college, and Mrs. Pender Chalmers, vice-chairman of the E.A.W. The course will be officially opened by Sir John Brooke, vice-chairman of the Electricity Commission, under the chairmanship of Councillor Mrs. Gregory, chairman of the E.A.W., and will continue with lectures, demonstrations and visits.

In conjunction with the Metropolitan-Vickers Electrical Co., Ltd., the Association last week made a motion study film at the Chester Electricity Department premises in Newgate Street showing economy in movements in connection with the preparation of household meals. The film shows the preparation of a breakfast for four in an "all-electric" kitchen, first in the ordinary way and then the preparation of the same meal as it might be by a method that effects a saving of 40 per cent. in time.

The E.P.E.A. Dinner

The eighteenth annual dinner to the members of the National Executive Council given by the Southern Division of the Electrical Power Engineers' Association is to be held on Saturday, October 3rd. This function, familiarly known as "the E.P.E.A. dinner," will again be held at the King's Hall, Holborn Restaurant, W.C.1. Following the precedent of recent years the latter part of the evening will be devoted to dancing. The principal guest this year will be Mr. C. D. Taite, chief engineer of the Lancashire Electric Power Co. Tickets, 8s. 6d. single, 17s. double for members, and 10s. 6d. for non-members, may be obtained from the hon. secretary, Mr. F. H. Smethurst, Tremorah, Lynton Road South, Gravesend, Kent.

Educational

Prospectuses are now available of the various courses at the Sir John Cass Technical Institute, the Northampton Polytechnic, the University of London (University College), and the Polytechnic, Regent Street, W.

Classes in electrical engineering open on September 28th at the School of Engineering and Navigation, South-East London Technical Institute, Hackney Technical Institute and Paddington Technical Institute.

Enrolments begin on September 17th, and the session commences on September 21st at the Battersea Polytechnic (Electrical Engineering Department).

The E.A.W. examination in electrical housecraft will be held on December 10th.

(See our classified advertisements.)

Appointments Vacant

Mains superintendent for Whitehaven Electricity Department.

Assistant town engineer for the Borough of San Fernando, Trinidad, B.W.I.

Meter inspector and tester for Thurrock U.D.C.

Control room attendants for Watford Electricity Department

Assistant mains superintendent for Carlisle Electricity Department.

Electrical engineering assistants in the Drawing Office of the Air Ministry.

Probationary inspector in the P.O. Engineering Department.

Assistant lecturer in electrical engineering at the University College (University of London).

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

MORLITE silvered interior reflector lamp, mushroom shape.

SUPRECISION instruments. Initial letter "F" above name and "H" below.

ALVERNE cigarette lighter.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mrs. Pender Chalmers has been appointed lighting art adviser to the British Thomson-Houston Co., Ltd., and will be attached to the Lamp Department at Crown House, Aldwych, W.C. Mrs. Pender Chalmers has been a director of the Electric Super Service Co., Ltd., for over ten years, and in this connection is a member of the Electrical Contractors' Association. She has specialised in home lighting and decoration and has had a showroom in Beauchamp Place to demonstrate various types of decorative lighting fittings.

[*Elliott & Fry*
Mrs. Pender Chalmers

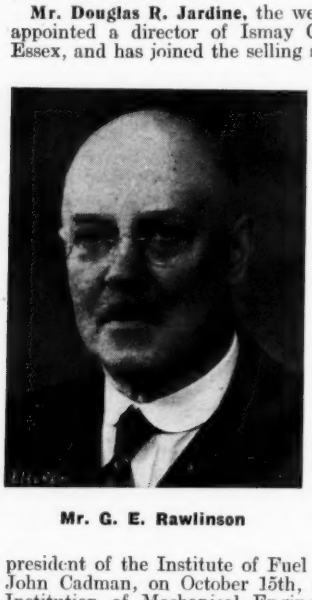
She is well known as a lecturer on various subjects connected with electricity and decoration and is vice-chairman of the Electrical Association for Women. Mrs. Pender Chalmers, apart from her electrical activities, is also one of the pioneers of private flying, and she and her husband have competed in the King's Cup Air Race.

Mr. N. Hunter, whose appointment as borough electrical engineer at Morley was briefly recorded in our last issue, served his apprenticeship with Messrs. A. Reyrolle & Co., Ltd., and received his technical education at Armstrong College, Newcastle-upon-Tyne. Subsequently he held various positions with the South Shields and Newark Corporations, the Yorkshire Electric Power Co., and the Sheerness & District Electric Supply Co., and is at present deputy borough electrical engineer to the Whitehaven Corporation, a position which he is vacating to take up his new appointment. He is an associate member of the I.E.E., and is also a member of the Transmission Section.

Mr. N. Hunter

Mr. Douglas R. Jardine, the well-known cricketer, has been appointed a director of Ismay Cables, Ltd., of Dagenham, Essex, and has joined the selling staff of the company.

Mr. G. E. Rawlinson, of Messrs. Baxendale & Co., Ltd., has completed forty years' service with the company, and, to mark the occasion, the directors have presented him with a gold watch suitably inscribed. Mr. Rawlinson commenced his business career with the National Electric Supply Co., Ltd., Preston, and when Mr. F. F. Bennett, chief engineer to the company, left to start business on his own account, with Mr. W. H. Druce as partner, Mr. Rawlinson joined the firm, and remained with them until the dissolution of the partnership, when he joined Messrs. Baxendale & Co., Ltd.



Mr. G. E. Rawlinson

Sir Philip Dawson, M.P., will be installed as president of the Institute of Fuel for the coming year by Sir John Cadman, on October 15th, in the meeting hall of the Institution of Mechanical Engineers. He will subsequently deliver his presidential address.

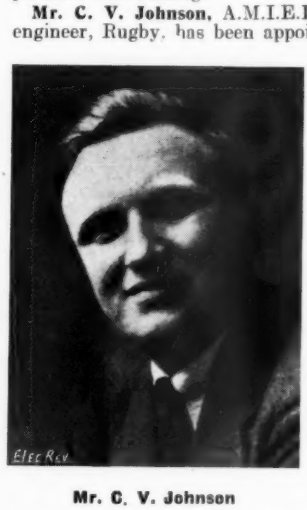
Mr. John Bruce, A.M.I.E.E., who recently severed his connection with the Barking power station of the County of London E.S. Co. to undertake private consulting work, has taken offices in Windsor House, Victoria Street, S.W.1.

Mr. W. A. Gillott, A.M.I.E.E., who, as announced here, recently resigned his position with the English Electric Co., Ltd., and accepted an appointment with British National Electrics, Ltd., Newarthill, Lanarkshire, has taken up his new duties as commercial manager with the latter company. Mr. Gillott has specialised in electric cooking and heating matters for upwards of thirty years, embracing the electricity supply aspect, advisory work upon the general development of domestic electrification, manufacturing and training. He became an associate member of the I.E.E. in 1912, and has read three papers on electric cooking and heating before the Institution; one was awarded a special premium.

[*Elliott & Fry*
Mr. W. A. Gillott

Mr. R. W. Bellis, of Wallasey, has been appointed sales service engineer in the Wallasey Corporation undertaking.

Mr. C. V. Johnson, A.M.I.E.E., deputy borough electrical engineer, Rugby, has been appointed borough electrical engineer at Eccles in succession to the late Mr. H. W. Angus. Mr. Johnson received his early training and experience as a junior with the Midland Electric Corporation for Power Distribution, and was for fifteen years with the Leicestershire & Warwickshire Electric Power Co., as mains superintendent. He has been deputy borough electrical engineer to Rugby Corporation for the past eighteen months.



Mr. C. V. Johnson

Mr. G. F. Moore, B.Sc. (Hons.), A.M.I.E.E., has been appointed deputy electrical engineer in the Kirkcaldy Electricity Department from forty-six applicants. Mr. Moore, after graduating at Leeds University, was engaged for a period of two years as a trainee with the Yorkshire Electric Power Company, and subsequently held appointments as assistant mains engineer in the Dundee Corporation Electricity Department and deputy mains superintendent with the Carlisle city electricity undertaking.

Mr. R. A. Watson Watt, B.Sc., F.Inst.P., M.I.E.E., superintendent of the radio research stations of the National Physical Laboratory, has been appointed superintendent of the Air Ministry Research Station, Bawdsey Manor, Suffolk. Mr. Watson Watt commenced his career as assistant to the Professor of Physics at the University College, Dundee, and later joined the staff of the Meteorological Office. His next position was officer-in-charge of the branch of the Meteorological Office at the Royal Aircraft Establishment, South Farnborough, and he was seconded to the Department of Scientific and Industrial Research on the formation of the Radio Research Board. In 1927 he took over the scientific direction of the Research Station at Slough, and on the unification of the station with the N.P.L. he became (in May, 1933) superintendent of the Radio Department of the N.P.L. He has served as chairman of the Wireless Section of the Institution of Electrical Engineers during the 1935-36 session.

[*Lafayette*
Mr. R. A. Watson Watt

Mr. W. J. Forster, A.M.I.E.E., mains superintendent in Rawtenstall Corporation electricity undertaking for five years, has been appointed deputy borough electrical engineer and manager at Heston and Isleworth at a commencing salary of £600, rising to £700 a year. Mr. Forster began his career at Stoke-on-Trent, serving for five years as mains assistant. He was afterwards district mains engineer at Hackney and deputy engineer at Stoke Newington.

Mr. W. H. Dorman Bostock, B.Sc., A.M.I.E.E., late of Siemens Bros. Dynamo Works, Ltd., the English Electric Co., Ltd., and the Brush Electrical Engineering Co., Ltd., has joined the staff of Lotus, Ltd., Stafford, and is managing the garage belonging to this company.

Mr. C. P. Lister, chairman of Messrs. R. A. Lister & Co., sailed for Canada on September 5th in the *Empress of Britain* for a month's visit to the Dominion. Mr. Lister will also represent Messrs. Blackstone & Co., of which he is chairman.

Major C. Pratt has joined the board of Messrs. Blackstone & Co., Ltd., and has taken up residence at Stamford. Major Pratt has had a wide experience of engineering in many parts of the world, having travelled extensively in Europe, South America and Africa.

Mr. F. L. Price, A.M.I.Mech.E., has been appointed Irish manager to Messrs. R. A. Lister & Co., Ltd. Mr. Price, who is well known in industrial circles in Ireland, has had a wide experience of engineering in all its branches, and for the past thirty years has been engineer representative for Messrs. Blackstone & Co., Ltd., with whom Messrs. Lister recently made a co-operation agreement, throughout Ireland. He has travelled widely on behalf of that concern, and last year visited Australia and New Zealand in connection with the development of its overseas trade.

Mr. O. Carter, formerly electrical and mechanical engineer at Kimblesworth Colliery, has been appointed chief engineer to the Pooley Hall Colliery Co., Ltd. Latterly he has been with the Charlaw & Sacriston Collieries, Ltd.

Mr. H. Dowd, chief of the Stores Department of the General Electric Co., Ltd., at Coventry, has retired after being with the company for thirty-four years. He has been presented by his colleagues with a wallet and monetary gift, and with a reading lamp by those in the Records and Order Office.

Mr. G. V. Desborough, sales engineer at the Manchester branch of Messrs. Johnson & Phillips, Ltd., has been presented by the staff of the branch with an electric clock on the occasion of his marriage.

Mr. G. V. Harrap, author of the article on "Electricity Regulations" which appears on page 333, was educated at Salford Secondary School and received his technical training at Manchester College of Technology. He served his apprenticeship with the Metropolitan-Vickers Electrical Co., Ltd., and was employed by the company from 1928 to 1930 on switchgear and transformer design. Later he held an appointment with the Dundee Corporation Electricity Department, being engaged on sub-station and distribution work. In April, 1933, he took up a position with the North Eastern Electric Supply Co., Ltd., (power station operation and h.v. transmission) and since May last he has been with the Hull Corporation Electricity Department. He is a graduate member of the I.E.E., a member of the Transmission Section, and has served on I.E.E. Students' Section committees. He was awarded a premium for a paper read to the Newcastle Section last year on "Electricity Supply Legislation." He is an associate of the American I.E.E.

Mr. F. W. Thorpe has resigned his position as director of the Maxlume Lighting & Heating Co., Ltd., a subsidiary of Veritys, Ltd., and is commencing the manufacture of a complete range of industrial lighting equipment on his own account as F. W. Thorpe, Ltd., 39, Bolton Road, Small Heath, Birmingham.

Mr. J. S. Nicholls has resigned his position as London district sales engineer with British National Electrics, Ltd., to take up a similar appointment with the Jackson Electric Stove Co., Ltd.

Mr. O. H. Fruh has been appointed sales manager to Vactric, Ltd., for the company's vacuum cleaners.

Mr. W. Easton, B.Sc., A.M.I.E.E., has been presented with a dressing case by members of the staff of Manchester Corporation Electricity Department on the occasion of his leaving to take up an appointment with the London Associated Electricity Undertakings, Ltd.

Mr. K. A. Waddoups, in charge of the electrical maintenance of the home appliance factory and the wiring department of the British Thomson-Houston Co., Ltd., at Rugby, who was recently married to Miss M. A. Shepherd, has been presented by his colleagues with a clock.

Obituary

Mr. Arthur E. Porte, M.I.E.E., who died recently at his home, Kinnity, Carrickmines, Co. Dublin, was a founder of the Engineering and Scientific Association of Ireland, and was joint secretary of that organisation. He was also prominent in connection with the Commercial Telephone Co., and later he became chief engineer of the Electrical Engineering Co. of Ireland. He was associated with his brother, Mr. F. C. Porte, an electrical contractor. A successful electrical consultant, he designed many of the largest private installations in the country, and with the late Mr. Mark Ruddle he planned the first public electrical installation in Dublin. The interment took place on September 1st, and among those who attended the funeral were Lt.-Col. S. W. Carty (hon. treasurer, Engineering and Scientific Association of Ireland), Messrs. G. Prescott, A.M.I.E.E., A. G. Bruty, M.I.E.E., H. Allberry (president, R.I.A.I.), and W. A. Dundas and S. Irwin (G.E.C.).

Dr. E. Weston.—With reference to the late Dr. Edward Weston, whose work and career were recorded in our last issue, Mr. E. B. Vignoles writes:—"The late Dr. Weston was honoured by all in the electrical industry as one of the great pioneers, and his development of the moving coil instrument in a form suitable for industrial use was of great importance in the early days of d.c. supply. But in the interests of historical accuracy, may I be allowed to point out that the Weston instrument was by no means the first direct-reading electrical measuring instrument as is stated in your obituary notice. Ayrton and Perry, the English pioneers of measurement, had developed forms of direct-reading instrument about 1882 or 1883, which I found in use at the Central Technical College when I went there in 1886; Major Cardew had produced the Cardew (hot-wire) voltmeter before that date; Evershed had designed and made his moving-iron instrument in 1885. *Vixere fortes ante Agamemnona*! When I entered the workshops of W. T. Goolden & Co. in 1888 I found in existence a quite substantial business in direct-reading instruments, developed by that firm and its predecessors; their records, now in the possession of their successors, Evershed & Vignoles, Ltd., show orders going back to 1886. The Navy were their chief customers, but if memory serves me correctly, the first Cardew voltmeter was sold to the Ordnance Survey, Southampton."

Mr. F. Thomson.—The death is recorded in the *Electrical World* of Mr. Frederick Thomson, one of Montreal's pioneers in the electrical field and brother to Dr. Elihu Thomson, which occurred on August 8th, at the age of eighty. Mr. Thomson assisted his brother, one of the organisers of the Thomson-Houston Co., in many of his early experiments. Born in Manchester, he went to the United States at an early age. In 1882 he went to Canada as electrician for the Thomson-Houston Co., of Canada, and when that company was sold and the name changed to the Royal Electric Co., he remained in the position of chief electrician. In 1893 he established his own business under the name of Fred Thomson & Co., of which he remained president until his death. He was one of the first to project the idea of the power transmission line from Montmorency to Quebec City. He also prepared the original plans for the line from Chambly to Montreal. He experimented in the construction of electric motors for street cars and in 1892 installed the first trolley line in Montreal. Mr. Thomson was one of the oldest members in years of membership as well as in age of the Engineering Institute of Canada.

Mr. G. W. Hitching.—We regret to record the death, which occurred on September 1st, of Mr. Gordon William Hitching, only son of Mr. W. W. Hitching, proprietor of Brittain's Electric Motor Co., of Lewisham.

Mrs. Dunsheath.—We are sure that our readers will unite with us in expressing deep sympathy with Dr. Percy Dunsheath (chief engineer, W. T. Henley's Telegraph Works Co., Ltd.), on the death of his wife, which occurred on September 5th after a long illness.

Mr. John Henry Atkinson, whose death is announced at the age of seventy-one years, has since 1901 been associated with the business of the British Thomson-Houston Co., Ltd., at Rugby. When the works were erected, he was sent to England by the General Electric Co. of America to commence the manufacture of electric lamps. He supervised the installation of the plant, and was responsible for the production of the first carbon filament lamp in the town.

Mr. W. D. Priestman.—The death occurred at Hull this week of Mr. William Dent Priestman, at the age of eighty-nine. Mr. Priestman was an early worker in the oil-engine field; his activities are referred to in a leaderette in this issue.

Mr. A. G. Morrish.—The death is announced, at the age of sixty-seven, of Mr. Arthur Gabriel Morrish, who was a director of a number of companies, including Broadcast Relay Service, Ltd., and Radio Relays, Ltd.

Will.—Mr. Alexander Spencer, M.I.Mech.E., president of the Research Association of British Rubber Manufacturers, chairman of the Lightfoot Refrigeration Co., Ltd., and chairman or director of a number of other companies, left £53,292, with net personalty £40,082.

The Institute of Marine Engineers

An examination for admission to associate membership of the Institute of Marine Engineers is to be held on November 16th-19th next. The annual examination for admission of probationer students and students will be held in June, 1937. The Institute's examinations are held in London and other centres according to candidates' places of residence. Full particulars of the syllabus and exemptions allowable may be obtained on application to the Secretary of the Institute, The Minories, London, E.C.3.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Combustion Efficiency Co., Ltd.—Private company. Registered September 4th. Capital, £5,000. Objects: To carry on the business of consulting, constructional, mechanical and electrical engineers, &c. The subscribers are: A. W. Kitching, Whittingdene, Leeds and Bradford Road, Bramley, Leeds, and E. E. Blackburn, 158, Common Road, Low Moor, Bradford. Secretary: A. Webster. Solicitors: A. V. Hammond & Co., Bradford.

Prospect Engineering Co., Ltd.—Private company. Registered September 4th. Capital, £100. Objects: To carry on the business of electrical, mechanical, chemical, and civil engineers, &c. The subscribers are: L. P. Law, 2, Lynette Avenue, S. Side, Clapham Common, S.W.4, and L. J. Coops, 35, Dundalk Road, S.E.4. Secretary: Nellie Baynes. Registered office: 55/56, Chancery Lane, W.C.2.

J. Stevens Radio, Ltd.—Private company. Registered September 5th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in gramophone and sound-reproducing machines, electric accumulators and batteries, wireless aerials, &c. The permanent directors are: J. W. Stevens, 280, Chingford Road, E.17, and Mrs. R. F. Rose, 72, Walmington Road, N.12. Registered office: 72, Wood Street, Walthamstow, E.17.

J. Harrison & Co. (Halifax), Ltd.—Private company. Registered September 5th. Capital, £3,000. Objects: To acquire the business of an electrical engineer and plumber now carried on by J. Harrison at 253, King Cross, and 1, Skircoat Moor Road, Halifax. The directors are: J. Harrison and Nellie Harrison, both of South Dene, Browfootgate Lane, Halifax, and A. Tidswell, 6, Denby Place, Tuel Lane, Sowerby Bridge. Registered office: 253, King Cross, Halifax.

Westminster Electric Lamp Co., Ltd.—Private company. Registered September 4th. Capital, £500. Objects: To carry on the business of makers and suppliers of and dealers in electric lamps and accessories of all kinds, &c. The subscribers are: C. F. Green, 13, Birchlands Avenue, Wandsworth Common, S.W.12, and G. Butler, 13-14, Hills Place, W.1. C. F. Green is first director and chairman. Registered office: Westminster Chambers, 3, Victoria Street, S.W.1.

Abercorn Shades (1936) Ltd.—Private company. Registered August 26th. Capital, £500. Objects: To carry on the business of shade manufacturers, &c. The subscribers are: P. J. Shannon, 72, The Grove, Edgware, Middlesex, and M. E. Inglis, 21, Thorpe Road, Barking, Essex. The first directors are: H. J. Steward, A. Freedman, H. G. Bates, S. I. Freedman, and E. M. Goodwin.

Pandora, Ltd.—Private company. Registered August 26th. Capital, £1,000. Objects: To carry on business as manufacturers and repairers of and dealers in advertising devices and appliances, whether electrical, mechanical or otherwise, electrical engineers and contractors, &c. The directors are: F. Baxter, Darrow, Hainault Road, Chigwell, A. G. Smyth-Tyrrell, Milton House, Milton Road, Shenfield, Essex. Secretary: W. G. J. Wade. Registered office: 37, Leadenhall Street, E.C.

Raysun, Ltd.—Private company. Registered September 4th. Capital, £1,000. Objects: To acquire the business of electrical engineers, metal workers and woodworkers carried on by Geoffrey T. Fairbank and Stephen J. Collyer. The directors are: G. T. Fairbank, 88, Bournbrook Road, Bournbrook, Birmingham, and two others. Registered office: York Terrace, Hockley Hill, Birmingham.

Meissner Coils R.A.P., Ltd.—Private company. Registered September 4th. Capital, £500. Objects: To carry on the business of manufacturers of and dealers in or distributors of radio tuning inductances, condensers, &c. The directors are: W. H. B. Johnson and B. B. Johnson, both of "Thornhill," St. Mary's Road, Long Ditton, Surrey. Registered office: Ferry Works, Summer Road, Thames Ditton.

Rentertainments (Midlands), Ltd.—Private company. Registered September 4th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in and to buy, sell and let on hire wireless and electrical apparatus and goods, &c. The directors are: H. Pickup, Sundore, Arterberry Road, Wimbledon, S.W.19, and two others. Registered office: 3, Balham Road, Lower Edmonton, N.

Rentertainments (Northern), Ltd.—Private company. Registered September 4th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in, and to buy, sell and let on hire wireless and electrical apparatus and goods, &c. The directors are: H. Pickup, Sundore, Arterberry Road, Wimbledon, S.W.19, and two others. Solicitors: Frere Cholmeley & Co., 28, Lincoln's Inn Fields, W.C.2.

Doto-Crystal Lamps, Ltd.—Private company. Registered September 1st. Capital, £5,000. Objects: To carry on business as sellers and manufacturers of and dealers in electric, gas, oil and other lamps, neon and cathode-ray tubes, &c. The subscribers are: H. J. Middleweek, 37, Leinster Gardens, W.2 (permanent managing director); and E. F. S. Hodges, 61, Cheapside, E.C.2. Solicitors: Wingfields Halse and Trustram, 61, Cheapside, E.C.2.

J. C. Holland (Radio), Ltd.—Private company. Registered in Belfast August 27th. Capital, £10,000. Objects: To carry on the business of wholesale and retail dealers in radio, television and electrical apparatus, and other sound-producing and musical instruments, &c. The directors are: J. C. Holland, 7, Harberton Avenue, Belfast; and J. J. Holland, 555, Oldpark Road, Belfast. Registered office: 3, Linenhall Street West, Belfast.

Burco, Ltd.—Private company. Registered September 2nd. Capital, £100. Objects: To acquire the undertaking and assets of Burnley Components, Ltd., including the trade name and trade mark "Burco," and all other patents, trade names and marks used in connection with the said business, and to carry on the business of engineers and manufacturers of electrical household appliances, ironmasters and founders, &c. The subscribers are: H. Buckley, J.P., Overleigh, Reedley, Burnley, and three others. Registered office: Waterside Mill, Rosegrove, Burnley.

Breeze Corporation of Great Britain, Ltd.—Private company. Registered September 3rd. Capital, £10,000. Objects: To carry on business as mechanical, electrical, radio, automobile and general engineers, manufacturers of and dealers in engines and motors and component parts thereof, metal founders and workers, builders, &c. The subscribers are: H. S. Bouchier, The Thatched House, Barton, Berks; and H. Smith, 5, Home Mead, Stanmore, Mdx. Solicitors: Godfrey Warr & Co., 19, Fenchurch Street, E.C.3.

Moores (M/C), Ltd.—Private company. Registered September 3rd. Capital, £1,000. Objects: To carry on the business of manufacturers of, wholesale and retail dealers in and agents for, insulators, insulating material, electrical, gas and oil lamps, quartz lamps, reflectors, bells, fires, cookers, switchboards, batteries, accumulators, wireless apparatus and accessories, &c. The directors are: J. Moores and Mrs. P. L. Moores, both of Glenfaba, Clifford Road, Poynton, Ches.

North-Eastern Electric Transport, Ltd.—Private company. Registered September 3rd. Capital, £7,200. Objects: To carry on the business of manufacturers of and dealers in electric vehicles of every description, motor, electrical and general engineers, garage and service station proprietors, &c. The directors are: C. F. Kress, 116, Witham, Hull, and five others.

Ismay Dirks Appliances, Ltd.—Private company. Registered September 3rd. Nominal capital, £20,000. Objects: To carry on the business of manufacturers of and dealers in machinery, plant and apparatus of every description, engineers, contractors, electricians, erectors, bonders, warehousemen, metal workers, scientific instrument makers, &c. The first directors are K. Bud and J. Ismay. Registered office: Sentinel House, Southampton Row, W.C.1.

Halcyon London Distributors, Ltd.—Private company. Registered September 3rd. Nominal capital, £500. Objects: To enter into and carry out contracts as agents or otherwise for the sale and distribution (both wholesale and retail) of all radio, telegraphic, television, telephonic and photographic apparatus, valves, equipments and accessories, metal workers, &c. The subscribers are: J. Ismay, Braemore Lodge, Sundridge Avenue, Bromley, Kent; and T. S. Cornwell, 31, Abbotswood Gardens, Ilford. J. Ismay signs as director.

Castle Electrical Instruments, Ltd.—Private company. Registered September 3rd. Capital, £1,000. Objects: To carry on the business of electrical and general engineers, founders, smiths, scientific instrument makers, manufacturers of and dealers in wireless and telephonic apparatus, &c. The directors are: P. R. Painton, 39, Newland, Northampton; and V. V. Rigby, 29, Bush Hill, Weston Favel, Northampton. Registered office: 32, Newland, Northampton.

Gilbert Radio, Ltd.—Private company. Registered August 24th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in wireless and television sets and components, &c. The subscribers are: E. Hibbard, 27, Ings Road, Hull, and two others. Solicitors: Howe & Co., 25, Bank Street, Sheffield.

F. Hamilton & Co., Ltd.—Private company. Registered August 24th. Capital, £150. Objects: To carry on the business of manufacturers and repairs of and dealers in dynamos, motors, armatures, magnetos, batteries, conductors, insulators, transformers, switchboards, electrical plant, &c. The directors are: H. A. Davies, 8, Kingsland Avenue, Oakhill, Stoke-on-Trent, and two others. Solicitors: J. E. Moxon & Co., 64, Miles Bank, Hanley, Stoke-on-Trent.

Nodisco, Ltd.—Private company. Registered September 4th. Capital, £100. Objects: To carry on the business of electrical contractors and agents, electricians, mechanical engineers, &c. The subscribers are: G. Reid Pitts, Raycombe, 54, Olive Avenue, Leigh-on-Sea, and W. G. Warner, 143, Elibank Road, Eltham, S.E.9. Solicitors: Roche, Son & Neale, 1, Church Court, Old Jewry, E.C.2.

Returns of Electrical Companies

Tye & Co., Ltd.—Mortgage debenture charged on the company's undertaking and property, including uncalled capital, dated August 19th, 1936, to secure £400. Holder: H. Tye, Beech Holme, Goffs Lane, Cheshunt.

Tungwire, Ltd.—Capital, £6,000 in 4,000 preference and 2,000 ordinary shares of £1. Return dated April 9th, 1936. All shares taken up. £6,000 paid. Mortgages and charges, nil.

A. H. Silcocks & Son, Ltd.—Capital, £3,000 in £1 shares. Return dated June 1st, 1936. All shares taken up. £3,000 paid. Mortgages and charges, nil.

Galsworthy, Ltd.—The nominal capital has been increased by the addition of £5,000 beyond the registered capital of £10,000. The additional capital is divided into 5,000 7½ per cent. non-cumulative participating preference shares of £1 each.

Accumulators "Elite," Ltd.—Debenture charged on the company's property and assets, including uncalled capital, dated

July 29th, 1936, to secure £1,000. Holder: C. T. Rhodes, Ashday Hall, Southowram, Halifax.

Gothic Electrical Supplies, Ltd.—Charge on 23 and 25, Constitution Hill, Birmingham, dated August 20th, 1936, to secure £4,500. Holders: Britannic Assurance Company, Ltd., Birmingham.

A. E. White & Co., Ltd.—J. C. Dawson, of The Red House, Duncombe Place, York, ceased to act as receiver and manager on August 18th, 1936.

Van Raden & Co., Ltd.—The nominal capital has been increased by the addition of £10,000 in £1 ordinary shares beyond the registered capital of £10,000.

Brand Electrical & Engineering Co., Ltd.—Capital, £1,000 in £1 shares. Return dated April 17th, 1936. 800 shares taken up. £800 paid. Mortgages and charges nil.

Padiham Wireless Company, Ltd.—Capital, £1,000 in £1 shares. Return dated April 9th, 1936. 825 shares taken up. £825 paid. Mortgages and charges nil.

C. P. Roots, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated August 10th, 1936, to secure £200. Holder: C. P. Roots, 19, Bank Street, Ashford, Kent.

East Suffolk Electricity Distribution Co., Ltd.—Capital, £50,000 in £1 shares. Return dated April 2nd, 1936. All shares taken up. £60,000 paid, being £1 per share on 38,000 and £1 16s. 8d. per share on 12,000 (including 16s. 8d. premium). Mortgages and charges: £17,150.

Nigerian Electricity Supply Corporation, Ltd.—Capital, £500,000 in 450,000 preferred ordinary shares of £1 each and 200,000 ordinary shares of 5s. each. Return dated August 4th, 1936. All shares taken up. £450,076 15s. paid on 450,000 preferred ordinary and 307 ordinary, £49,923 5s. considered as paid on 199,693 ordinary. Mortgages and charges: £206,404.

Pye Radio, Ltd.—Capital, £200,000 in 1,000,000 deferred ordinary shares of 1s. each and 150,000 preferred ordinary shares of £1 each. Return dated June 17th, 1936. 660,000 deferred and 150,000 preferred shares taken up. £161,500 paid on 230,000 deferred and 150,000 preferred, £21,500 considered as paid on 430,000 deferred. Mortgages and charges, nil.

S. G. Brown (Radio Relay Products), Ltd.—Capital, £250 in £1 shares. Return dated May 13th, 1936. All shares taken up. £250 paid. Mortgages and charges, nil.

Fullick & Loosley, Ltd.—Capital, £1,000 in 600 preference and 400 ordinary shares of £1. Return dated June 3rd, 1936. Eighty preference and 400 ordinary shares taken up. £370 paid, £110 considered as paid. Mortgages and charges, nil.

Newey & Eyre, Ltd.—Capital, £4,000 in £1 shares. Return dated July 25th, 1936. 2,552 shares taken up. £2,552 paid. Mortgages and charges: £2,095.

Associated Electrical Industries, Ltd.—The nominal capital has been increased by the addition of £100,000 beyond the registered capital of £6,395,000. The additional capital is divided into 100,000 8 per cent. cumulative preference shares of £1 each, ranking *pari passu* with existing 8 per cent. cumulative preference shares.

Wm. Geipel, Ltd.—Capital, £25,150 in £1 shares (25,000 preference, 100 "A" ordinary" and 50 "B" ordinary).—Return dated May 7th, 1936. All shares taken up. £23,650 paid on 23,500 preference, 100 'A" and 50 "B" ordinary. £1,500 considered as paid on 1,500 preference. Mortgages and charges, nil.

Barlborough Electric Supply Co., Ltd.—Capital, £3,000 in £1 shares. Return dated June 1st, 1936. 2,967 shares taken up. £2,967 paid. Mortgages and charges, nil.

Sphere Electric Instrument Co., Ltd.—Capital, £1,000 in £1 shares. Return dated May 7th, 1936. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Electro-Rentals, Ltd.—Capital, £15,000 in £1 shares. Return dated June 8th, 1936. 13,100 shares taken up. £13,100 paid. Mortgages and charges, nil.

Downton Electric Light Co., Ltd.—Capital, £17,500 in £1 shares (10,000 ordinary and 7,500 6 per cent. preference). Return dated March 26th, 1936. 9,000 ordinary and 3,957 preference shares taken up. £657 paid. £12,300 considered as paid. Mortgages and charges, nil.

B. P. Electrical Co., Ltd.—H. Devereux, of 175, Ramsden Road, Balham, S.W., was appointed receiver and manager on August 31st, 1936, under powers contained in debenture dated July 7th, 1936.

Provincial Tramways Co., Ltd.—Satisfaction in full on August 28th, 1936, of trust deeds dated January 24th, 1908, and May 18th, 1927, and registered January 29th, 1908, and May 23rd, 1927, respectively, securing £175,000 5½ per cent. 1st debenture stock.

Thomas Winston, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated August 27th, 1936, to secure £15,000. Holders: Bank Hey Street Stores, Ltd., 54/62, Bank Hey Street, Blackpool.

Century Lamps (London), Ltd.—Particulars filed of £500 debentures authorised August 4th, 1936, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

City Notes

Ismay Industries, Ltd., held its first annual meeting on September 3rd, when Mr. John Ismay (chairman), who presided, said that they were a holding company, roughly half of their capital being invested in the electric lamp trade and associated businesses, and the other half in a number of different enterprises. Their lighting trade was represented by their interest in subsidiary companies, and their total shareholdings in those companies were worth much more than the balance sheet figure of £403,000. So far as the lighting trade was concerned they were well established, their trade progressing steadily in both domestic and speciality lamps. They had investments in fifteen associated companies, the principal of which was the Sterling Works, Dagenham, an estate of about 20 acres containing a number of entirely separate freehold factories. One of these works manufactured "Halcyon" radio sets, "Electrix" electric sweepers, and electric clocks. They had disposed of the whole of the output of radio sets budgeted for. The sweeper business was progressing favourably, and they had overcome the initial difficulties with regard to electric clocks. The summer had been an unfavourable one for refrigerators, but they had nevertheless sold 3,000 "Zeros" refrigerators, which gave an idea of what could be done in a favourable year. The Knivetown Cable Co. was progressing in its manufacture of flex and small cables. They had just completed a new factory at Dagenham for batteries, and they were going ahead with their factory for paper cables.

Companies to be Struck off the Register.—The names of the following companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—Aldersgate Electrical Co., Ltd.; British Battery Co., Ltd.; Court Radio Co., Ltd.; Eons Electrical Co., Ltd.; Harry's Wireless Service, Ltd.; Hart's Wireless Supplies, Ltd.; Hill & Co. (Radio), Ltd.; Spalton Electrical Stores, Ltd.; Werneth Electrical Engineering Co., Ltd.

British Ropes, Ltd., is paying an interim dividend on the 7 per cent. non-cumulative preferred ordinary shares in respect of the half-year to June 30th last. It is proposed to deal with the dividend on the ordinary share capital when the accounts for the complete year are available. The directors state that the progress made by the company as shown in the last annual report has been more than maintained during the current year.

The Scottish Power Co. is paying an interim dividend of 6d. per £1 unit, less tax, on the ordinary stock. This is at the same rate as for the corresponding period of last year, but the present dividend is on £570,000 more capital.

Burco, Ltd.—The registration of this company is recorded on page 358, and the *Financial Times* reports that arrangements are being made for an offer for sale of 5s. shares. The number of shares involved and the issue price have not yet been decided.

Electrical Finance & Securities Co., Ltd., has decided to issue 75,000 ordinary shares of £1 each at 40s. per share to the holders of the existing 200,000 ordinary shares to the extent of 37½ per cent. of their holdings. The shares will not be entitled to participate in any interim dividend in respect of 1936.

The British Power & Light Corporation has announced an interim dividend of 2 per cent. on the £1,690,616 ordinary stock (unchanged). The new shares issued to shareholders last March do not participate in the dividend now announced.

Edmundsons Electricity Corporation, Ltd., reports that the results of the operations of its group of companies during August, as compared with the corresponding month of 1935, show an increase of 13 per cent. in kWh sold.

The Greengate & Irwell Rubber Co., Ltd., has declared an interim dividend of 9d. per share on the 16s. ordinary shares (same).

The Electric Supply Corporation, Ltd., is maintaining its interim ordinary dividend at 3½ per cent., actual, less tax.

Stocks and Shares

TUESDAY EVENING.

IT is said in the Stock Exchange that a good many people postponed their holidays this year, partly because of the weather, partly because of the unusual activity prevailing in the markets for stocks and shares, the latter serving as an inducement to delay departures from town. The markets have fallen upon rather quieter days, and according to the argument just quoted, this affords an excuse for business men to slip away in order to get a breath of fresh air before the winter. Certainly it is a fact that the activity in Stock Exchange markets has quietened down to a noticeable extent. This does not mean to say, however, that prices are lower. Public interest has waned to some extent even in the industrial and mining shares which previously had been in high favour. Prices are well maintained. There are no reactions of any consequence, as will be seen by reference to the price-lists given overleaf.

The New York Stock Exchange is in a bullish temper. In Paris, where a good deal of money is evidently available for investment, the sentiment is strongly British so far as securities are concerned, whatever it may be in relation to political affairs. A good deal of foreign money continues to flow into British securities, with the result that prices remain decidedly good on the whole.

Gilt-edged Stocks

Prices in the gilt-edged market continue to move in a manner which confounds the theory that a rising price-level for fixed interest securities is incompatible with expanding industrial activity. Government stocks show appreciable gains on last week. Among the electricity, and other boards' issues, the price of L.P.T.B. "A" 4½ per cent. stock gained a point to 123½, "C" is stronger at 107. The Central Electricity Board 4½ per cent. stock, 1951-1973, strengthened to 111¼. West Midland fives regained part of the dividend deduction.

Among factors which contribute towards firmness in these and kindred securities is the belief in a continuance of cheap monetary conditions. This has induced some of the big institutions to enter the market with renewed confidence. In addition, a proportion of the substantial interest payments made on September 1st is coming back to the market for re-

investment. The security offered by gilt-edged British securities has lost none of its attraction for foreign capital.

Bull Points

The attraction of electrical shares, for investment purposes, received a further fillip from the latest plans of the Central Electricity Board. Directions have been issued authorising fresh expenditure involving £1,250,000. The Board is now looking as far ahead as the winter of 1938-39: over £5,000,000 has been already earmarked as provision for that period. Another £7,500,000 will have been spent in preparation for the coming winter, and expenditure of a slightly larger sum has been authorised in respect of the following one, 1937-38.

From the size and anticipatory nature of these schemes, the holder of electrical shares can draw solid assurance that demand for electricity and equipment will continue to grow at its present rate, and, in all probability, will gather further momentum. The railways are spending big sums on electrical works, and the electrical companies are, of course, participating widely in most branches of this country's industrial recovery, as well as in the defence programme.

In view of the difficulty in obtaining anything but a meagre return on invested money, it is not surprising to find buyers favouring the electrical markets in their search for shares with sound security combined with promising prospects.

Electricity Supply Issues

North Metropolitans are 9d. higher at 58s. 3d.; otherwise the Home electricity supply market presents its customary stolid front. Electrical Finance and Securities, after falling from 3¼ to 3, ex-rights, rallied to 3⅜ upon publication of the terms of the anticipated share issue. Electric Supply Corporations, British Light and Power and Scottish Power are, like the interim dividends, unchanged. The Scottish Power dividend will be paid on capital increased by £570,000 since last year's distribution.

The Overseas group is a little more interesting. The stern measures proposed in Palestine emphasised the gravity of local conditions, for which reason the price of Palestine Electric "A" shares reacted 2s. to 48s. 3d., despite the excellent report issued a few days ago. Jerusalem Electrics remain steady round 36s. Atlas Trusts sagged at 6s. 6d., and others to lose ground were Calcuttas, 56s., and Peraks, 28s. 3d.

The Edmundsons Control

More information is now available regarding the deal which resulted in the return from America to this country of the controlling interest in Edmundsons Electricity Corporation. It transpires that the principal companies on the purchasing side are the Cushion Trust, Ltd., Imperial Continental Gas Association, and the Prudential Assurance Company, Ltd. The sum involved is in the neighbourhood of six million pounds sterling.

First news of the transaction came at the end of July with the announcement that a British group, headed by the firm of Lazard Bros., acting on behalf of itself and associates, had acquired from Utilities Power & Light Corporation that company's holding in the Greater London & Counties Trust, which, in its turn, held a controlling interest in Edmundsons. All the latter company's issued ordinary shares not held by the public, totalling about 2,700,000 shares, were included in the transfer.

The Participants

The deal was effected, it appears, firstly by the division of unissued shares in Greater London & Counties Trust into 2,747,100 "A" shares and about a tenth of that number of "B" shares, both classes having a denomination of 1s. Practically all the shares were allotted, to be paid for in cash, at premiums of 42s. 9d. and 3s. respectively, to the three companies mentioned. The Cushion Trust (in which the Lazard Bros. and other interests are understood to be included) took all the "B" and 1,175,600 of the "A" shares; Imperial Continental Gas Association took 1,000,000, and the Prudential Company 571,425 of the "A" shares. At the time when the "A" shares were allotted, at a total price of 43s. 9d. per share, Edmundsons ordinary were quoted at 44s. 9d.

Electrical Equipment Shares

All-round firmness, with one or two features of outstanding strength, characterises the market for electrical equipment shares. Buying of General Electrics assumed large proportions: with holders unwilling to be tempted out of their shares, the price soared to 94s. 6d., as compared with 87s. a week ago. On the basis of the last dividend, the yield is now only a few shillings over 3 per cent. Crompton Parkinsons returned to something like their old form in jumping five shillings to 4¼. Several large blocks of the shares have recently come to market, and their realisation caused a reaction to 81s. 6d. The cables group is progressive, with Callenders, 4⅛, the best feature, and British Insulated and Enfields each ⅛ to the good. Lancashire Dynamos continued in request up to £3. Hall Telephones improved to 24s.; other telephone shares are little changed. There has been noticeable buying of Allen Wests up to 7s. 3d., the shares being considered to have interesting possibilities as a result of the recently completed reconstruction scheme. Ismay Industries moved up to 8s. after the company's first annual meeting. The Brush Electrical report, for the year ended December 31st, 1935, shows a deficit of £83,799. For the present year, the report states that a further increase in turnover is assured at somewhat better prices.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend. Previous.	Dividend. Last.	Price. Sept. 8.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	77/6	—	3 17 5
City of London	1	7½	7½	37/-	—	4 1 1
Clyde Valley	1	7	8	46/-	—	3 9 7
County of London	1	10½	10½	54/6xd.	+6d.	3 17 2
Edmundson's 7% Pref.	1	7	7	35/6	—	3 19 0
Do. Ord.	1	8	8	45/-	—	3 11 0
Elec. Dis. Yorkshire	1	9	9	47/-	—	3 16 7
Elec. Fin. and Securities... ...	1	12½	12½	3½	—	4 0 0
Elec. Supply Corporation ...	1	11	11	60/9	—	3 12 4
Lancs Light and Power	1	7½	7½	38/-	—	3 19 0
Lond. Assoc. Electric	1	—	7	35/-	—	4 0 0
London Electric	1	7	8	39/6	—	4 1 1
London Power Deb. Red. ...	Stock	5	5	107½	—	4 13 0
Metropolitan	1	10	10	51/-	—	3 18 5
Midland Counties	1	7	7½	41/-	—	3 13 2
Mid. Elec. Power	1	8	8	45/-	—	3 11 1
North Eastern Electric Ordinary	1	6	6	35/6xd.	—	3 7 7
Do. 7% Pref.	1	7	7	36/-xd.	—	3 17 9
Northampton	1	10	10	51/3	—	3 18 2
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 3
North Met. Elec. Ordinary ...	1	10	10	58/3	+9d.	3 8 7
Do. do. 6% Pref. ...	1	6	6	32/6	—	3 13 10
Scottish Power	1	8	8	42/6	—	3 15 5
South London	1	7	7	34/6xd.	+6d.	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/6	—	6 13 4
Yorkshire Elec.	1	8	8	44/-	—	3 12 9

PUBLIC BOARDS.

Central Electricity, 1950–70 ...	Stock	5	5	116½	—	4 5 9
Do. 1955–75 ...	„	5	5	118½xd.	—	4 4 4
Do. 1951–73 ...	„	4½	4½	111½	+½	4 0 9
Do. 1963–93 ...	„	—	3½	104	—	3 7 4
London Elec. Trans. Gtd. ...	„	—	2½	96	—	2 12 1
London & Home Counties, 1955–75	„	4½	4½	114	—	3 19 0
London Passenger Transport, A...	„	—	4½	123½	+1	3 13 0
Do. do B...	„	—	5	128½	—	3 17 10
Do. do C...	„	3½	4	107	+1	3 14 9
West Midlands Joint Elec. 1948–68	„	—	5	115½xd.	+1	4 6 7

TELEGRAPH AND TELEPHONE.

American Tel. & Tel.	$100	9	9	174½	—	5 3 2
Anglo-Am. Tel. Pref.	Stock	6	6	127½	—	4 14 1
Do. Def.	„	1½	1½	32	—	4 13 9
Cable & Wireless 5½% Pref. ...	„	4½	5½	101	−1	5 9 0
Do. A. 7½% Ord.	„	Nil	Nil	21	−⅜	—
Do. B. Ord.	„	Nil	Nil	6	−⅛	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	14xd.	+2/-	3 4 4
Do. Do. Pref.	10	6	6	14½xd.	—	4 4 3
Great Northern Tel.	10	20	20	46	—	4 7 0
Marconi-Marine	1	10	7½	35/-	+1/6	4 5 9
Oriental Telephone Ord.	1	12*	12*	3½	—	3 13 10

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	1/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	„	5	5	1525	+25	—
Do. do. Pref. Ord.	„	8	8	175½	—	4 11 2
Brazil Traction	100	—	30 cts	11⅞	−⅛	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	104½	+2	4 15 8
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 1st Bonds	$500	5	5	45	—	—
Victoria Falls Ord.	1	20	12	3⅞	—	3 1 10
West Riding	1	5	6½	50/-	—	2 12 9

MANUFACTURING COMPANIES.

Aron Electricity Ord.	1	10	15	65/-	—	4 12 4
Assoc. Elec. Ord.	1	6	8	55/-	—	2 18 2
Do. Pref.	1	8	8	39/6	—	4 1 0
Babcock & Wilcox	1	8	8	52/6	+½	3 1 0
British Aluminium Ord.	1	7½	7½	42/6	—	3 10 7
British Insulated Ord.	1	15	20	5⅛	+1/6	3 10 0
Brush Ord....	Stock	Nil	Nil	45½	—	—
Callender's	1	15	15	4⅜	+⅛	3 5 6
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord. ...	5/-	—	12½	4½	+⅛	—
Do. 8% Pref.	1	8	8	2	—	4 0 0
Edison Swan 1st Pref.	1	7½	7½	30/-	—	5 0 0
Electric Construction	1	3½	7	40/-	—	3 10 0
Enfield Cable Ord.	1	25	25	5⅜	+1/6	4 7 0
English Electric	1	Nil	Nil	27/3	+9d.	—
Do. Do. Pref.	1	Nil.	Nil	27/6	—	—
Ericsson Tel.	5/-	24	20*	2⅛	—	1 17 3
Ever Ready	5/-	35	35	26/9	−9d.	6 10 10
Ferranti Pref.	1	7	7	28/9	—	4 17 5
G.E.C. Pref.	1	6½	6½	35/-	—	3 14 4
Do. Ord.	1	10	15	94/6	+⅛	3 3 6
Henleys	1	30	30	7½xd.	−1/6	4 0 0
Do. 4½% Pref.	5	4½	4½	5⅜	—	3 18 3
India-Rubber Preferred	1	—	5½	1⅛	—	4 17 9
Johnson & Phillips	1	7½	10	55/-	—	3 12 9
Lancashire Dynamo	1	5	10	3xd.	+3/3	3 6 8
Siemens Ord.	1	4	6	33/9	+1/6	3 11 1
Telegraph Construction	£1	Nil	Nil	33/9	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be numbered and abridged, and all subsequent proceedings will be taken.

1934

3181. "Cathode-ray tubes." L. F. Broadway. November 8th, 1934. (451766.)

1935

434. "Means for testing electric insulation." W. T. Henley's Telegraph Works Co., Ltd., and J. H. Savage. January 5th, 1935. (451768.)

695. "Device for determining the existence or the direction of a magnetic field." E. Caretta. January 8th, 1935. (451850.)

4200. "Efficiency and fault indicators for electric-light systems." W. A. B. Ames, J. Crawford, United Electrical Co. (Coolex), Ltd., F. R. Pendergast and S. E. Sheerman. February 9th, 1935. (451851.)

4563. "Electrical plug-and-socket couplings." British Thomson-Houston Co., Ltd., W. H. Brown and H. E. Goody. February 11th, 1935. (451773.)

4576. "Method and means for insulating and protecting the windings of electric motors." M. Surjaninoff (né Geider). February 15th, 1934. (451776.)

4438. "Light-beam signalling or the like systems." R. Cadzow. February 12th, 1935. (451854.)

4478. "Electrolytic condensers." Ferranti, Ltd., and E. Chesworth. February 12th, 1935. (451857.)

4530. "Traffic control systems." Automatic Electric Co., Ltd., and A. P. B. Renshaw. February 12th, 1935. (451863.)

4531. "Telephone or like systems and impulse senders for use therein." J. E. Pollak (Associated Electric Laboratories, Inc.). February 12th, 1935. (451864.)

4547. "Electron-discharge devices and circuits therefor." W. S. Percival. February 12th, 1935. (451866.)

4554. "Transportable trunk-communication electric-cable installations." J. T. Shevlin (Siemens and Halske Akt.-Ges.). February 12th, 1935. (452008.)

4613. "Electric-light illuminations." G. Allom. February 13th, 1935. (452009.)

4672. "Cathode-ray tubes." F. H. Nicoll. February 13th, 1935. (452012.)

4687. "Remote control and/or indicating systems." Automatic Electric Co., Ltd., and G. A. Burns. February 13th, 1935. (451954.)

4690. "Electrical phase-shifting networks." P. W. Willans, and Baird Television, Ltd. February 13th, 1935. (451786.)

4783. "Variable and adjustable electric condensers." Murphy Radio, Ltd., and A. Shackell. February 14th, 1935. (452016.)

4793. "Electrical time circuit arrangements and oscillation generators." Marconi's Wireless Telegraph Co., Ltd., and A. J. Young. February 14th, 1935. (452017.)

4838. "Apparatus for testing high-tension electrical systems." D. T. Mansell. February 14th, 1935. (Cognate application 23383/35.) (452117.)

4841. "Systems for the electrical transmission of signals." Allgemeine Elektricitats-Ges. May 8th, 1934. (452023.)

4856. "Detector circuit for television reception." Radio Akt.-Ges. D. S. Loewe. February 16th, 1934. (Addition to 435417.) (452118.)

4910. "Electric transformers." British Thomson-Houston Co., Ltd. February 16th, 1934. (452028.)

4911. "Electric trigger relays and similar devices." Callender's Cable and Construction Co., Ltd., and H. T. Gooding. February 15th, 1935. (452029.)

4920. "Electric condensers." General Electric Co., Ltd., D. Dow and G. G. Morris. February 15th, 1935. (452030.)

4957. "Vacuum tubes." Standard Telephones and Cables, Ltd., and W. T. Gibson. February 15th, 1935. (452034.)

4953. "Electric terminals." Standard Telephones and Cables, Ltd., and R. A. L. Cole. February 15th, 1935. (452035.)

4975. "Image-dissector and method of electron beam analysis." F. S. Turner. February 15th, 1935. (452037.)

4992. "Telephone systems." Automatic Electric Co., Ltd., and O. A. Pearce. February 15th, 1935. (452038.)

5017. "System or method of scanning an image, for use in conjunction with any moving spot scanning device, for television or the like." H. A. Richardson. February 16th, 1935. (Addition to 425660.) (451959.)

5073. "Incandescent electric lamps." Z. Dezsoe. February 16th, 1935. (Addition to 445489.) (452121.)

5094. "Anodes for electron-discharge devices." C. S. Bull. February 16th, 1935. (452045.)

5178. "Microphones." A. H. Midgley. February 20th, 1935. (Cognate applications 7834/35 and 20354/35.) (452051.)

5732. "Electric vacuum switches." British Thomson-Houston Co., Ltd. February 23rd, 1934. (451963.)

5803. "Electrical power systems for driving auxiliary apparatus in boiler houses and the like." F. A. Eastwood and Associated Electrical Industries, Ltd. February 22nd, 1935. (452052.)

6139. "Heater elements for indirectly heated thermionic cathodes." M-O. Valve Co., Ltd., and G. W. Warren. February 26th, 1935. (452054.)

7129. "Scanning apparatus for television or like systems." H. A. Richardson. July 22nd, 1935. (Addition to 428459.) (451966.)

7675. "Time-controlled electric switches." Horstmann Gear Co., Ltd., and B. G. Horstmann. March 12th, 1935. (452055.)

7729. "Electromagnetic vibratory devices for safety razors." R. Goldschmidt. March 12th, 1935. (451870.)

7774. "Means for filling oil-filled containers for electrical apparatus." Asea Electric, Ltd., and A. Schaanning. March 13th, 1935. (451706.)

9482. "Electrical appliances such as coupling-sockets, switches and fuses." G. E. Crabtree, W. T. Elliott, E. Badham and R. W. Thornton (legal representatives of J. A. Crabtree, decd.). March 27th, 1935. (451708.)

11117. "Thermionic oscillators." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 7th, 1934. (451974.)

12557. "Translating devices for translating electrical variations into light variations." Marconi's Wireless Telegraph Co., Ltd., and L. M. Myers. April 26th, 1935. (451876.)

12559. "Electron-discharge device oscillator arrangements." Marconi's Wireless Telegraph Co., Ltd., and A. T. Witts. April 26th, 1935. (451877.)

12985. "Fusible electric cut-outs." W. T. Henley's Telegraph Works Co., Ltd., and H. W. Breeze. May 1st, 1935. (Cognate application 6142/36.) (452058.)

13144. "Connection of conductors to dynamo and like laminated brushes." Siemens Planiawerke Akt.-Ges. für Kohlefabrikate. January 17th, 1935. (451714.)

13999. "Electric protective devices." English Electric Co., Ltd., and W. Donnelly. May 13th, 1935. (451716.)

14235. "Television receivers." General Electric Co., Ltd., and L. C. Jesty. May 15th, 1935. (451980.)

17036. "Electrical condensers." Plessey Co., Ltd., (P. R. Mallory and Co., Inc.). June 13th, 1935. (451983.)

19220. "Electric oscillation generator." Farnsworth Television, Inc. July 5th, 1934. (451724.)

20774. "Thermionic electrodes." General Electric Co., Ltd., (Patent-Treuhand Ges. für Elektrische Gluhlampen). July 22nd, 1935. (451989.)

21046. "Spring sockets for plug couplings." Carr Fastener Co., Ltd., and G. Wagstaff. July 24th, 1935. (451990.)

25507. "Means for controlling fields of incandescent lamps." Reklanaktiebolaget Epok. September 13th, 1934. (451993.)

25721. "Impulse senders of the dial type for use in telephone or like systems." J. E. Pollak (Associated Electric Laboratories, Inc.). February 12th, 1935. (Divided out of 451864.) (451897.)

27613. "Television." Radio Akt.-Ges. D. S. Loewe. October 11th, 1934. (452068.)

29439. "Electric cooking vessels." G. Wilkinson. December 16th, 1935. (452070.)

30358. "Lighting circuits for automobiles." L. C. Rudkin. November 2nd, 1935. (451898.)

30699. "Methods of electrical purification of gases containing elementary sulphur." Bolidens Gruvaktiebolag. June 4th, 1935. (452073.)

31650. "Television." Radio Akt.-Ges. D. S. Loewe. November 17th, 1934. (452745.)

35126. "Incandescent electric lamps." Z. Dezsoe. December 18th, 1935. (Addition to 446297.) (452079.)

35524. "Method of electroplating aluminium with metal." Vereinigte Aluminium-Werke Akt.-Ges. December 24th, 1934. (451904.)

35910. "Means for the production of frequency-modulated electrical oscillations." W. G. Gordon and R. E. B. Makinson. December 29th, 1934. (452080.)

1936

690. "Means for illumination controlled by photoelectric devices." General Electric Co., Ltd. January 8th, 1935. (451830.)

948. "Systems for recording, reproducing or transmitting signals by means of electric currents." Electrical Research Products, Inc. January 15th, 1935. (452084.)

3933. "Direction-finding aerial arrangements for use on aircraft and other vehicles." Marconi's Wireless Telegraph Co., Ltd. (Telefunken Ges. für Drahtlose Telegraphie). February 8th, 1936. (452093.)

4940. "High-frequency electrical oscillatory apparatus." Marconi's Wireless Telegraph Co., Ltd. February 21st, 1935. (451758.)

5672. "Fluorescent screens." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 27th, 1935. (452097.)

6070. "High-potential safety fuses." Siemens-Schuckertwerke Akt.-Ges. April 27th, 1935. (452100.)

7218. "Direct-reading radio direction-finders." Standard Telephones & Cables, Ltd. May 24th, 1934. (Divided out of 6013/35.) (452102.)

8890. "Means for controlling electrical circuits." British Thomson-Houston Co., Ltd. March 30th, 1935. (452104.)

9045. "Traffic control systems." Automatic Electric Co., Ltd., and A. P. B. Renshaw. February 12th, 1935. (Divided out of 451863.) (451921.)

9713. "Scanning apparatus." H. A. Richardson. April 2nd, 1936. (Addition to 428459.) (452105.)

11281. "Means for reducing torsional oscillation of motors." British Thomson-Houston Co., Ltd. April 20th, 1935. (451924.)

13537. "Method of eliminating interference in the wireless transmission of intelligence." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 14th, 1935. (452107.)

13745. "Switch frog operating gear for overhead electric conductors." E. M. Skerritt, T. M. Watson and S. C. Bennett. May 15th, 1936. (452108.)

13788. "Photo-electric tube." F. S. Turner. February 15th, 1935. (Divided out of 452037.) (452109.)

20237. "Cathode-ray tubes." F. H. Nicoll. February 13th, 1935. (Divided out of 452012.) (452125.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 2nd:—

Bafil. No. 568437. Class 8. Electrical rectifiers (not being machines) for charging accumulators.—E. M. Francis, Ltd., Heathcote Grove, Chingford, Essex.

Powdra. No. 570575. Class 13. Electric lamps (ordinary).—British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.

Silverlac. No. 570677. Class 13. Conduit tubes for electric wires and fittings for such conduit tubes.—General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

Lo-Vo-Lite. No. 570355. Class 18. Lighting installations.—Igranic Electric Co., Ltd., 147, Queen Victoria Street, E.C.4.

Lactorn. No. 568539. Class 50. Material made principally of casein and sold in sheets, rods and tubes for industrial purposes and articles made from such material.—British Xylonite Co., Ltd., Hale End, Essex.